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No. 6

## LAKE FREIGHT SITUATION—ORE SHIPMENTS.

The fears of iron ore shippers regarding a boom fall in the lake trade were very much allayed by reports covering the July movement. A summary of statements from all the shipping ports shows a total of 3,697,823 gross tons shipped during the month. This establishes a record. It is 659,263 tons more than was shipped in July of last year. A similar gain during the present month, which is not improbable, would bring the shipments on Sept. 1 up to about what they were a year ago, as the shortage on the first of the present month, notwithstanding delays in the opening of navigation, had been reduced to 792,962 tons. It is expected, of course, that there will be a very heavy grain movement, especially from the head of Lake Superior, and on this account the situation a month ago was not very encouraging from the ore shippers' standpoint. There is still a general shortage of coal freights and prospects of plenty of work for the vessels through to the close of navigation, but it must be admitted that the very heavy movement of ore under way for a month past will relieve that important branch of the lake trade from extremely high freights, even in event of the large grain shipments that are looked for during the closing months of the season. It is quite probable that the ore shippers would have been confronted with a different situation and might still be uncertain as to their position for the balance of the year but for the very light movement of grain. It would seem that practically the entire lake fleet has been given over to ore. In July of last year Chicago shipped 13,000,000 bushels of corn, as against little more than 2,000,000 bushels of the same grain during the month just passed. The ore movement by months for this year and last is shown in the following table:

### IRON ORE SHIPMENTS.

|                                  | Gross tons. |           |
|----------------------------------|-------------|-----------|
|                                  | 1900.       | 1901.     |
| To June 1.....                   | 3,265,888   | 1,589,775 |
| June .....                       | 3,149,952   | 3,373,833 |
| July .....                       | 3,038,560   | 3,697,823 |
| August .....                     | 2,911,622   | .....     |
| September .....                  | 2,519,043   | .....     |
| October .....                    | 2,402,887   | .....     |
| November and December .....      | 1,282,358   | .....     |
|                                  | 18,570,310  | .....     |
| Shipments to August 1, 1900..... | 9,454,400   | .....     |
| Shipments to August 1, 1901..... | 8,661,431   | .....     |
| Decrease .....                   | 792,969     | .....     |

## SHIP CONSTRUCTION DURING JULY.

The bureau of navigation reports 112 vessels of 16,120 gross tons were built in the United States and officially numbered during July as follows:

|                         | WOOD. |             | STEEL. |             | TOTAL.     |             |
|-------------------------|-------|-------------|--------|-------------|------------|-------------|
|                         | SAIL. |             | STEAM. |             | ALL STEAM. |             |
|                         | No.   | Gross tons. | No.    | Gross tons. | No.        | Gross tons. |
| Atlantic and gulf ..... | 33    | 2,161       | 27     | 1,366       | 60         | 3,527       |
| Pacific .....           | 4     | 2,597       | 6      | 757         | 10         | 3,354       |
| Great lakes .....       | 3     | 107         | 9      | 442         | 12         | 549         |
| Western rivers .....    | 6     | 114         | 15     | 968         | 21         | 1,082       |
| Total.....              | 46    | 4,979       | 57     | 3,533       | 103        | 8,512       |

Plans have been completed at the navy department for the construction of the new dry dock at the New York navy yard and bids will soon be invited for the work. The new dock is to have a depth of 30 ft. and will be built of stone masonry and have every facility for docking the largest ships. Plans have also been drawn for the construction of a stone masonry dock even larger than the proposed New York dock at the new naval station at Charleston, to take the place of the dock at Port Royal. The necessary land at Charleston has been acquired and the specifications for this work will soon be completed. The cost of these docks will be over \$1,000,000 apiece.

It has just been learned that naval vessels of the North Atlantic squadron have established another world's record in the matter of coal-ing ships. Up to the time the squadron visited Pensacola the British armored cruiser Adriane of the channel fleet held the record, by taking on board 203 tons of coal within one hour. The Kearsarge, the Alabama and the Massachusetts of the United States navy each broke this record at Pensacola by the following figures: Kearsarge, 219 tons of coal in one hour; Alabama, 222 tons of coal in one hour; Massachusetts, 248 tons of coal in one hour.

On her latest trip to this country the Deutschland logged 601 knots in one nautical day of 24 hours and 50 minutes. This is the greatest day's work ever done by a steamship. Her average hourly speed was 24.19 knots and at times she obtained a speed of about 25 knots. Nearly one ton of coal was consumed for every knot covered.

The Celtic of the White Star line, the largest vessel in the world, reached New York on her maiden voyage last Sunday morning. Her time from Liverpool was 8 days and 46 minutes. Her average speed was 14.95 knots.

## STILL A FULL MILLION SHORT.

TONS OF FREIGHT TO AND FROM LAKE SUPERIOR TO AUGUST 1, 1901, COMPARED WITH AUGUST 1, 1900.

The monthly movement of freight to and from Lake Superior is approaching the five-million-ton mark, but the aggregate for the season to the first of the present month is still more than a million tons behind last year, on account of the late opening of navigation. On August 1 a year ago the total freight movement through both canals at the Sault (Canadian and United States) was 12,775,246 net tons, against 11,548,192 on August 1 of this year, a decrease of 1,227,054 tons. It would be well to note, however, that the July freight movement this year is in round numbers 261,000 tons greater than the business of any other month in the history of the canal, so that the loss is being quite rapidly made up. The decreases compared with last year are set forth in detail in the table printed below. Principal among them are a little more than 10,000,000 bushels in wheat, 573,014 tons (net) iron ore, 471,091 tons bituminous coal, and 42,674 tons anthracite coal.

### MOVEMENT OF PRINCIPAL ITEMS OF FREIGHT TO AND FROM LAKE SUPERIOR.

| ITEMS.                          | To Aug. 1, 1901. | To Aug. 1, 1900. | To Aug. 1, 1899. |
|---------------------------------|------------------|------------------|------------------|
| Coal, anthracite, net tons..... | 274,698          | 317,363          | 392,523          |
| Coal, bituminous, net tons..... | 1,640,096        | 2,111,187        | 1,227,038        |
| Iron ore, net tons.....         | 7,685,808        | 8,258,822        | 6,474,735        |
| Wheat, bushels.....             | 13,595,296       | 23,865,065       | 21,076,558       |
| Flour, barrels.....             | 2,969,966        | 2,559,913        | 2,570,858        |

REPORT OF FREIGHT AND PASSENGER TRAFFIC TO AND FROM LAKE SUPERIOR, FROM OPENING OF NAVIGATION TO AUGUST 1 OF EACH YEAR FOR THREE YEARS PAST.

### EAST BOUND.

| ITEMS.                        | Designation. | To Aug. 1, 1901. | To Aug. 1, 1900. | To Aug. 1, 1899. |
|-------------------------------|--------------|------------------|------------------|------------------|
| Copper .....                  | Net tons...  | 38,508           | 59,801           | 45,343           |
| Grain, other than wheat ..... | Bushels....  | 6,120,510        | 5,160,238        | 13,841,379       |
| Building stone .....          | Net tons...  | 15,280           | 10,616           | 12,655           |
| Flour .....                   | Barrels....  | 2,969,786        | 2,559,751        | 2,570,858        |
| Iron ore .....                | Net tons...  | 7,685,808        | 8,258,822        | 6,474,735        |
| Iron, pig.....                | Net tons...  | 16,759           | 10,163           | 13,319           |
| Lumber .....                  | M. ft. b. m. | 431,616          | 368,069          | 421,210          |
| Silver ore.....               | Net tons...  | .....            | .....            | .....            |
| Wheat .....                   | Bushels....  | 13,595,296       | 23,865,065       | 21,076,558       |
| Unclassified freight .....    | Net tons...  | 16,745           | 22,946           | 71,697           |
| Passengers.....               | Number....   | 13,301           | 11,704           | 10,271           |

### WEST BOUND.

|                           |               |           |           |           |
|---------------------------|---------------|-----------|-----------|-----------|
| Coal, anthracite.....     | Net tons...   | 274,698   | 317,363   | 392,523   |
| Coal, bituminous.....     | Net tons ..   | 1,640,096 | 2,111,187 | 1,227,038 |
| Flour .....               | Barrels ..... | 180       | 162       | .....     |
| Grain .....               | Bushels.....  | 52,330    | 5,584     | 14,500    |
| Manufactured iron.....    | Net tons...   | 43,428    | 64,933    | 57,246    |
| Salt .....                | Barrels ..... | 216,659   | 101,193   | 158,419   |
| Unclassified freight..... | Net tons...   | 205,727   | 196,619   | 185,560   |
| Passengers.....           | Number ...    | 14,859    | 12,386    | 12,053    |

### SUMMARY OF TOTAL FREIGHT MOVEMENT IN TONS.

|                                                | To Aug. 1, 1901. | To Aug. 1, 1900. | To Aug. 1, 1899. |
|------------------------------------------------|------------------|------------------|------------------|
| East bound freight of all kinds, net tons..... | 9,350,923        | 10,069,802       | 8,547,607        |
| West bound freight of all kinds, net tons..... | 2,197,269        | 2,705,444        | 1,886,268        |
|                                                | 11,548,192       | 12,775,246       | 10,433,875       |

Total number of vessel passages to Aug. 1, 1901, was 8,511 and the registered tonnage 10,147,518.

The executive committee of the canal association of greater New York has come to the conclusion that the interests of New York will be better subserved by the construction of the 1,000-ton barge canal than by the deep water way canal. This is a sensible conclusion to reach. The barge canal is practicable; the ship canal is impracticable, because the high cost of construction and operation is prohibitive.

The Cunard Steamship Co. contradicts the report, printed somewhat extensively in the newspapers, that it has decided to construct a 25-knot steamship to capture the Atlantic record.



## THE FLOATING DRY DOCK AT HAVANA.

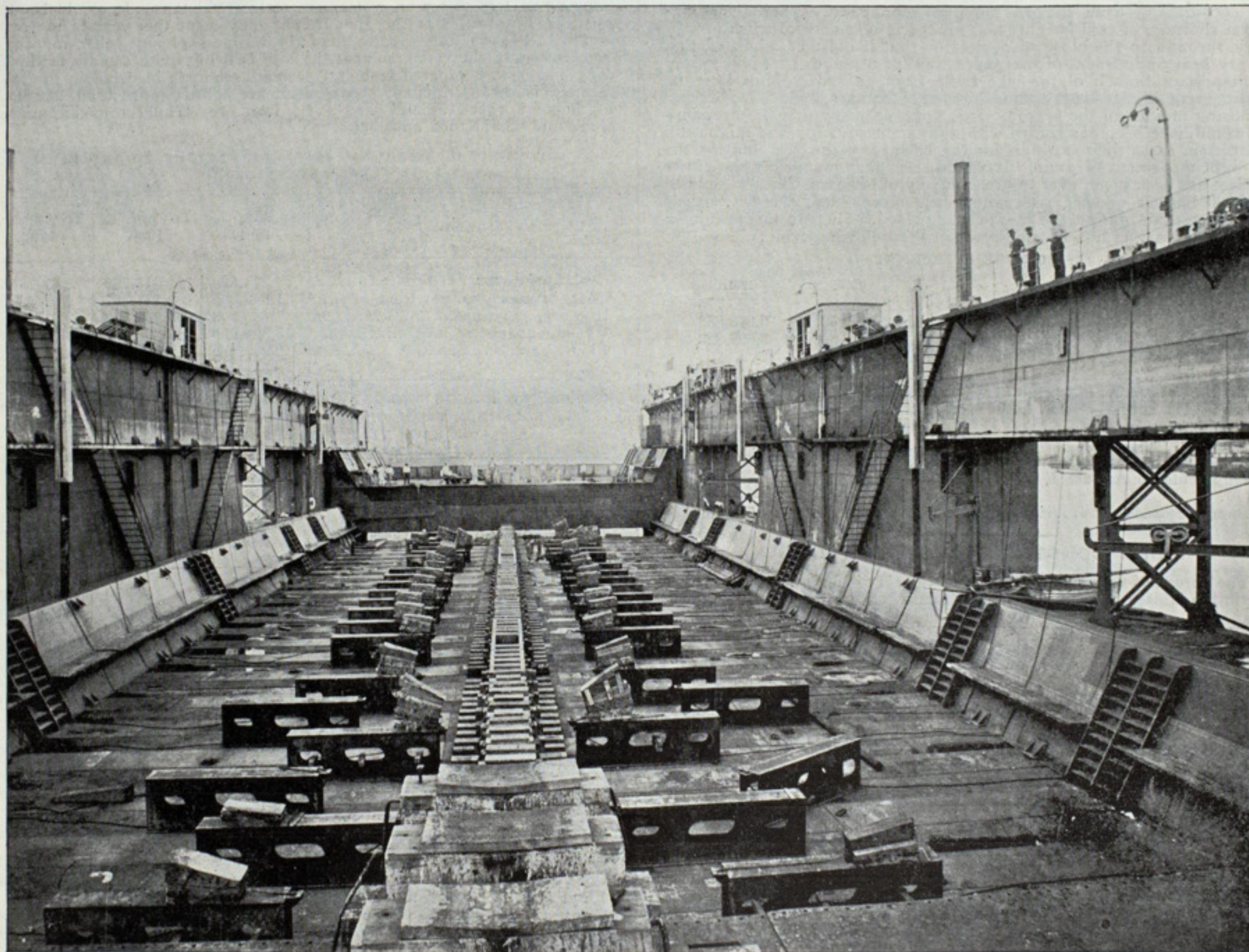
As recently announced in the Review, the navy department has bought from the Spanish government the floating steel dry dock which has been lying so long in Havana harbor. The purchase price was \$185,000. Naval Constructor Gillmor of the United States navy is now in Havana superintending preparations for towing the dock to Olongapo, the naval base in the Philippine islands. The route has not yet been determined upon, but it is probable that it will be via Suez if the locks of the canal will permit. Following is a general description of the dock by Messrs. Clark & Stanfield of London, its designers, kindly furnished to the Review by Rear Admiral Mordecai T. Endicott, chief of the bureau of yards and docks, to whom the Review is also indebted for the illustrations herewith:

The dock consists of three portions—the pontoons or body of the dock which afford the required buoyancy; the high sides or walls which regulate the descent of the pontoons below the water and also afford

frames and large gussets and in the middle of each bay by a strong plate, called a breathing plate, which is connected by frames and by a certain plate to be transverse girders. The central region of the pontoon is therefore of very strong construction and capable of supporting the ship anywhere. The sides of the pontoons extend up to a height of 20 ft. A deck 2 ft. wide runs on the top of these sides and forms a broad altar. This deck is carried on a series of A frames or large gussets, which are a continuation upwards of the transverse girders of the pontoons, and the face of these A frames is plated in forming a water tight box that extends 8 ft. 9 in. above the deck of the pontoon. These air boxes or altars afford a very large amount of stability to the dock at the time when most required.

The deck of the pontoon, and also the plating of the face of the altars is prolonged beyond the true length of the pontoon so that the decks of any two contiguous pontoons come within 2 in. of each other. The nar-

The Havana Floating Dry Dock.



FROM A PHOTOGRAPH TAKEN FROM THE INNER END OF ONE OF THE END PONTOONS.

the necessary stability; the movable caisson or gates that are only used when it is required to increase the lifting power of the dock. The overall length of the dock is 450 ft.; clear width between board altars, 82 ft.; depth over the sill, 27 ft. 6 in.; draught of water under these conditions, 42 ft. 6 in., and the free board 4 ft. 2 in.

The pontoons are five in number, three, the middle ones, being rectangular in shape, and two, the end ones, being finished off in the form of a point. The width of all the pontoons is 87 ft. 11½ in.; the length of the rectangular ones is 75 ft., and that of the pointed ones, 108 ft. 4 in. There is a space of 2 ft. between each pontoon. They are separate from and lie wholly between the two walls. They consist of ordinary mild steel water tight boxes 11 ft. 8½ in. deep, plated in on all sides and stiffened transversely by a series of girders forming bulkheads that run across them every 8 ft. 4 in., being strongly attached to the top and bottom skin plating by double angles. Longitudinally the pontoons are stiffened by a series of angle irons spaced every 2 ft. 1 in., forming square frames connected at their corners and diagonalized. These frames form a complete series of lattice girders running from one end of the pontoon to the other. The pontoons are also stiffened in the same sense by three water tight bulkheads, one under the line of the keel of the vessel and the other under each bilge respectively.

These bulkheads divide the pontoons into four separate water tight compartments. The central bulkhead is strongly stiffened by double

row opening left between them is closed when required by a flat plate with a rubber lining, which is bolted to the deck plating of each pontoon, thus making the deck of all the pontoons into a continuous water tight floor. The pointed ends of the extreme pontoons have light bulwarks of the same height as the keel blocks and therefore they and the face of the altars form with the continuous deck a "pound" from which water can be pumped and extra lifting power obtained.

The plating of each transverse bulkhead and that of each A frame is continued through the skin plating and stiffened on the outside by means of double angles of heavy section. The projecting flanges of these angles are pierced with large holes.

### HIGH SIDES OR WALLS OF THE DOCK.

The walls are two in number, and have each an over-all length of 383 ft. 4 1-3 in., a breadth of 9 ft. 2½ in. and a moulded height of 44 ft. 2½ in. Like the pontoons they consist of rectangular structures plated all over and stiffened on the inside by a series of angle-iron frames that are strongly gusseted at the corners diagonalized and cross-strutted. These frames are placed every 2 ft. 1 in., but every fourth one is in the form of a partial bulkhead, and at every 75 ft. there is a complete water tight plate bulkhead. At intervals the sides are stiffened by strong horizontal stringers, the one which comes level with the top of the altars being in the form of a partial deck. At a height of 32 ft. 6 in. the walls are divided by a complete water tight deck and the chamber above this



into which the water is never admitted serves as engine, boiler, dynamo and motor rooms, cabins for the captain and crew and general storeroom.

Between the level of the partial and engine deck two large gangway openings 50 ft. by 15 ft. 2 in. high are left in the walls, forming an easy method of access to the pontoon deck, and also giving light and air to the bilge of the ship.

The partial and complete bulkheads of the walls like the girders in the pontoons are continued through the skin plating and stiffened by strong double angles. These are likewise pierced with large holes. The position of these projecting angles, both vertically and in plan, is so arranged that they come directly opposite to the similar angles on the outside of the pontoons, the edges of the two series almost touching. The actual joint or connection between the walls and the pontoons is made by means of double fish plates that are bolted on to each side of the projecting angles. The holes on the fish plates and angles are slightly coned, so that the bolts draw all up into true contact, and make each pin take its share of the work. At the height of the top of the gangway passage a light running deck is outriggered from the walls, forming a useful stage on which the ship can be shored or stages slung for painting the hull. The top deck is of a width of 12 ft. 3½ in., being outriggered on the inside, thus affording a broad level platform on which are placed the valve houses and from where the whole of the manipulation of the dock is carried out. It is protected by hand railing all around. Suitable ladders with easy treads lead from the top deck to the broad altars and pontoon deck at suitable intervals. In a similar manner the cabins and storerooms, etc., are all provided with ladders of a suitable type.

The compartments between the engine and top decks are divided by bulkheads into various divisions forming boiler rooms, motor rooms, etc., and at each end cabins are provided for the accommodation of the crew, officers, etc. Other compartments are reserved for the ordinary stores

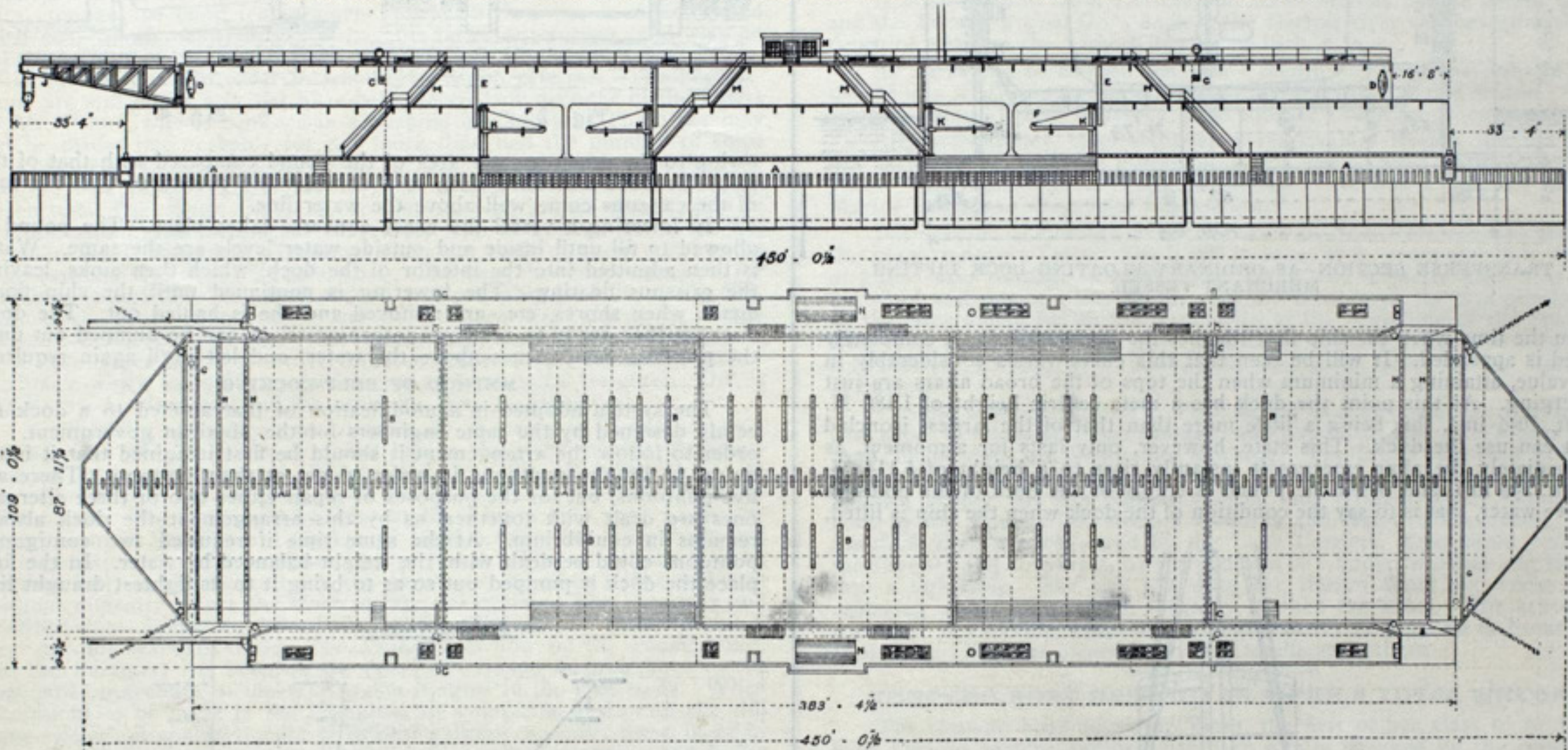
place. As water flows into the pound it equalizes the pressure on the two sides of the caissons until when the pound is full they again float out of their slots and can be towed away or otherwise removed.

#### ELECTRIC PUMPING INSTALLATION.

The pumping out of the dock is done by means of electricity. For this purpose two generating plants are provided, one in each wall, but with connecting cables so that either can supply the whole dock. Each plant is complete with boiler, engine and direct-coupled dynamo. The power is transmitted by cables having their switches and resistances located in the valve house to ten electric motors, five in each wall. These motors are vertical, and drive direct on to the shafts of the horizontal centrifugal pumps placed right down at the bottom of the walls so as to rely as little as possible on suction. The pumps discharge out on their own level through the skin plating, the orifices being thus always below the water level. The pumps are placed on the top of the main drain from which branch out the distributing pipes, each one governed by its own valve. There is a pipe to each water tight compartment of the dock, or thirty in all, so that the regulations of the dock is under the most complete control. The valve rods are lead up to the top deck and from thence by means of rods and cranks are all worked by levers placed in the valve houses, so that the valve men have not only the motors under their direct control, but also the manipulation of every valve, so that they can regulate the whole dock when either lowering or raising a vessel, without moving from their posts.

Special attention has been given to the berthing of the vessels. For this purpose steam capstans are provided on the top deck for hauling them into position. Two pairs of self-centering side shores, consisting of heavy timbers, contained in recesses in the walls, are provided. These shores are screwed out by a worm and rack worked from the deck, and

SELF-DOCKING FLOATING GRAVING DOCK FOR LIFTING IRONCLADS OF 10,000 TONS DISPLACEMENT.



A—Keel blocks. B—Sliding bilge blocks. C—Mechanical self-centering side shores. D—Spring roller fender. E—Spring rubbing timber. F—Gangway passages. G—Caissons. H—Grooves for caissons. J—Flying gangway and crane. K—Hand cranes. L—Mooring bollards and cables. M—Ladders. N—Valve house.

and gear of the dock. Each room has its own skylight and companion and is properly ventilated and lighted. The dock is moored from the four corners by anchors and chains taking onto heavy bitts strongly bolted to the altars proper. Hawse-pipes are provided where the cables pass over the end bulwarks.

It has been found by calculations that the heaviest ironclads in the Spanish navy when raised in this dock as high as it can, when working as an ordinary floating dock, will be lightened to a draught line of about 5 ft. As it is only when the ship is in this position that the caissons come into play, their height only requires to be equal to this draught of ship plus the height of the keel blocks. The height of the caissons, therefore, is fixed at 8 ft. 9 in., which is the same as that of the altars. They make themselves tight in a slot constructed of iron channels riveted on the pontoon deck and passing up the face of the altars. The slots were spaced to suit the different vessels of the Spanish navy, their greatest distance apart being 383 ft. and their least 349 ft. 8 in., these representing the lengths of the longest and shortest vessels. They consist of rectangular boxes 80 ft. 10 in. by 7 ft. 10 in. by 4 ft. 1 in., divided by bulkheads into various compartments, of which some of sufficient capacity to prevent the caisson sinking are hermetically sealed. The others are open to the water and the caissons are so ballasted that when these are full they float on a level keel with their deck but a few inches above water. They are furnished with a timber feather-edge scraped at the ends to fit the slope of the face of the altars and packed with a rubber cushion, which makes a water tight joint against the channels on the decks of the pontoons.

Floating with their decks almost awash they are hauled into position as the dock is being pumped out, and as this rises it picks them up and the feather edges engage in the slots. The pound is then formed and the water pumped out. As the inside water is lowered the caissons make themselves tight in their slots by their own weight, as when the pound is completely emptied the water level outside of them is only 2 ft. 6 in. above the pontoon deck, so that the pressure against their faces is altogether insignificant. In lowering the deck the converse action takes

each pair is geared together across the dock, so that as they are screwed out they both advance equally and simultaneously, and when each bear against the ship between them this must find itself over the center line of the dock. The painting stages and top altars are provided with cast iron shoes, into which ordinary timber shores may be fitted for supporting the ship's bilges. In addition, ordinary running bilge blocks are provided. These consist of a lower part of wrought iron, which can be placed anywhere on the deck of the dock, and therefore, if necessary, concentrated under any special part of the ship, and a timber or sliding part in the form of a wedge, which is hauled in under the bilges of the ship by means of chains worked from the top deck. The keel blocks are placed every 2 ft. 1 in. centers so that they may offer a very solid berth. They are of pitch pine with an oak capping piece. The dock is fully provided with minor fittings, such as rubbing timbers, belaying cleats, ringbolts and proper mooring bitts, all such accessories being of the most complete and modern description.

Special swinging gangways are provided at the stern of the dock, which not only serve as a means of communication from one wall to the other, but can be used also as crane jibs, and as their strength is sufficient to support a weight of 15 tons at their extremity they will be found very useful for dealing with propellers and such heavy weights. The dock is provided with a complete electric installation, the engine and motor rooms and cabins being provided with glow lamps, whilst the outside has an installation of 10 arc lamps to enable work to be carried on at all hours. Leads are provided along the sides of the walls, from which flow lamps can be taken off to illuminate any particular spot inside or outside the ship.

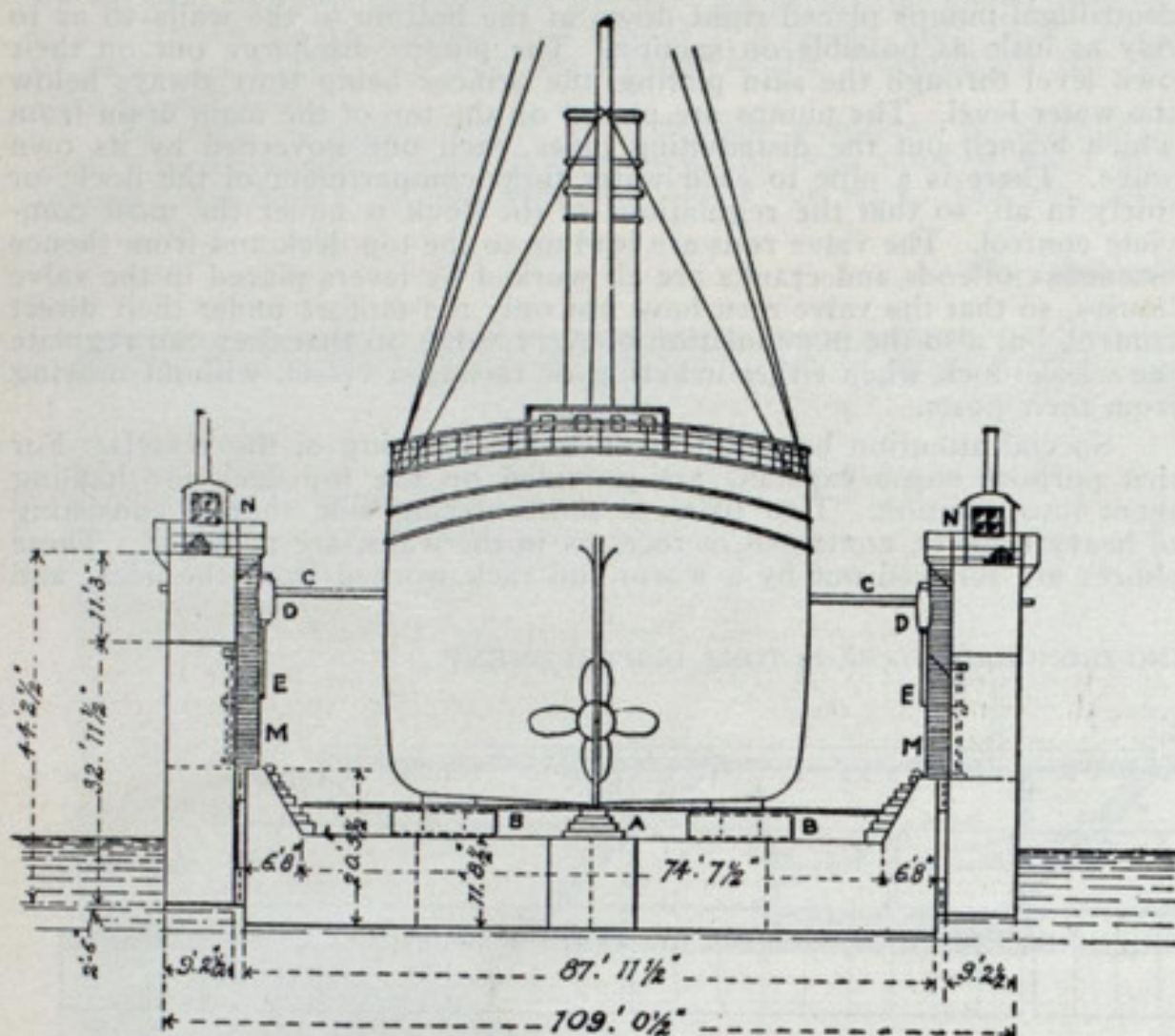
#### STRENGTH OF THE ELEMENTS OF THE DOCK.

The whole of the dock is constructed of mild steel fastened with iron rivets. Special attention has been given to all details, and the material has nowhere to support a greater strain than 10 kilos per square millimeter (6.349 tons per square inch), whilst the rivets work only at 8 kilos



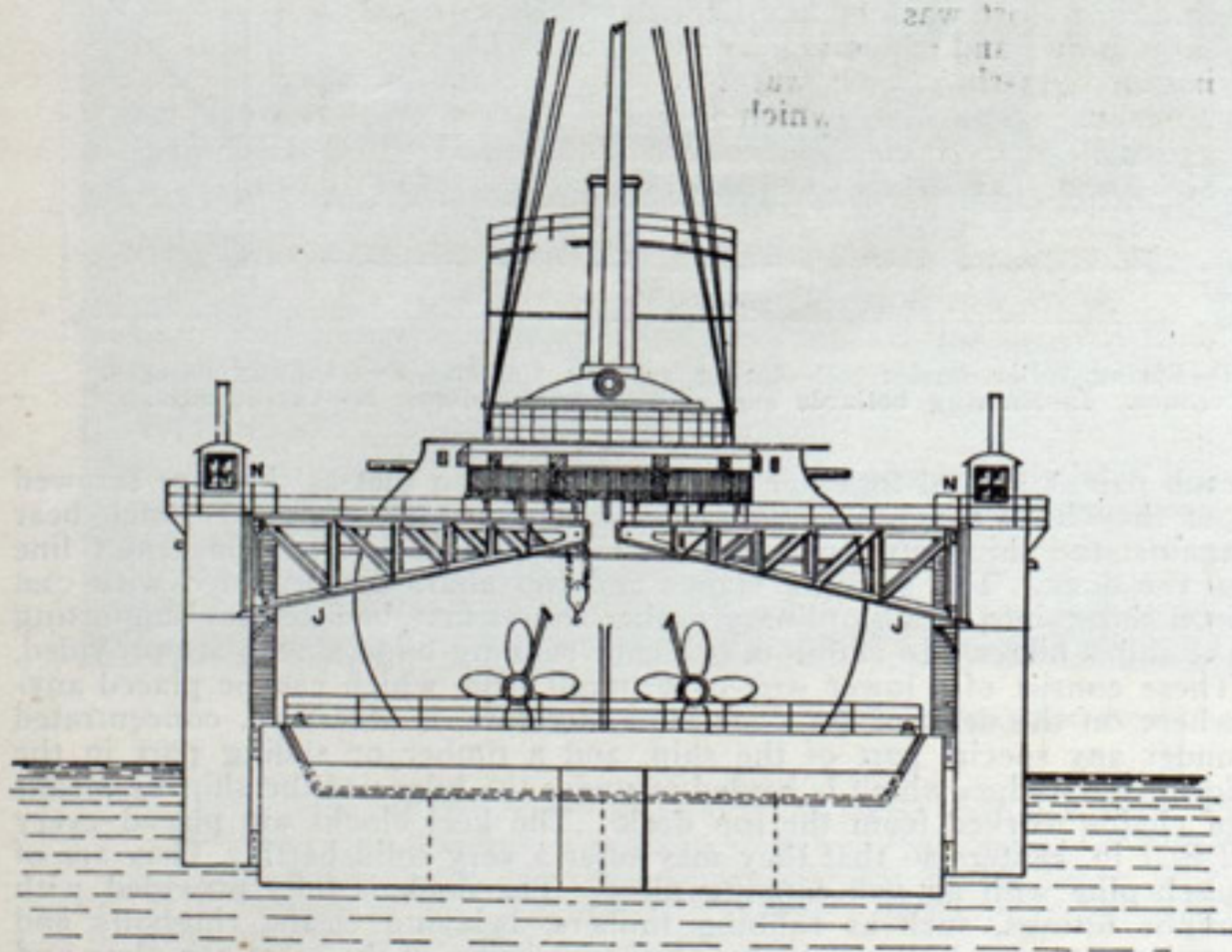
(5 tons per square inch). In all the principal elements the strain has been kept below this figure, the main transverse girders that support the ship working only 6,627 kilos (419 tons). The walls are of great longitudinal strength, it having been a provision of the contract that the dock should be of sufficient stiffness to support a vessel of 10,000 tons when the same only bore over 80 meters of the length of the dock. Although the use of the gates does away with the necessity of this excessive stiffness, still excess of longitudinal rigidity is by no means a bad fault.

Another point to which special attention has been given, warranted by the size and magnitude of the structure, is the question of its stability. A curve of the meta-centric heights and co-efficients of transverse stability



TRANSVERSE SECTION—AS ORDINARY FLOATING DOCK LIFTING MERCHANT VESSEL.

from the time when the ship first touches the dock until she is completely lifted is appended. It will be seen that this curve varies considerably in its value, attaining a minimum when the tops of the broad altars are just emerging. At this point the dock has a meta-centric height of 1.186 M. (3 ft. 10 3/4 in.), this being a little more than that of the largest ironclad that can use the dock. This state, however, only lasts for a moment, as immediately the altar emerges it instantly rises to a height of 5.114 M. (16 ft. 9 3/8 in.), and when the pound is empty or the deck of the pontoon above water, that is to say the condition of the dock when the ship is lifted,



END ELEVATION—AS CAISSON DOCK LIFTING IRONCLAD.

it attains the large value of 15.292 (5,082 in.). Expressing these figures in co-efficients of stability, we obtain the enormous value of 22,796 meters, which is equivalent to saying that it would require an external effort of 19,355 meter tons (63,502 foot tons) to lay the dock over 5° from the horizontal. When it is remembered that the largest vessel which uses the dock would only require an effort of 851 meter tons to produce the same heel, and this vessel moreover has to face heavy seas whilst the dock lies always at anchor in the calmest water, it will be evident that the conditions of stability are such as to afford the most complete security in every imaginable contingency.

#### METHOD OF WORKING THE DOCK.

This floating graving dock is worked in exactly the same way as any ordinary floating dock, and therefore but the barest description is necessary. It is lowered in the first place by admitting water into the pontoons, and walls being kept in a horizontal position by regulating the amounts

admitted into the various compartments by means of the valves, until there is sufficient depth of water over the keel blocks to enable a ship to be floated in over them. When in position in a fore-and-aft sense, the self-centering shores are screwed out and these push the ship between them until its keel comes true over the center line of the dock. Water is then pumped out of the compartments of the dock, which rises and begins to lift the ship. As this goes on further ordinary timber shores are inserted so as to keep the vessel steady, the dock itself being kept on a level keel by manipulating the valves and pumping more or less water either from one side or the other. When a considerable portion of the weight of the vessel has been taken by the keel blocks, the bilge shores are hauled in by means of their chains, thus affording a secure berth for the vessel. In the case of an ordinary ship the dock is merely pumped out until the deck is brought above water, when the ship is lifted, but when an iron clad is on the dock the caissons are floated into position over their slots whilst the dock is rising. When the dock has risen sufficiently to catch these in their slots, further pumping from the inner compartments is stopped and the pound valves are opened and the water removed therefrom, when the bottom of the ship will be left dry, and

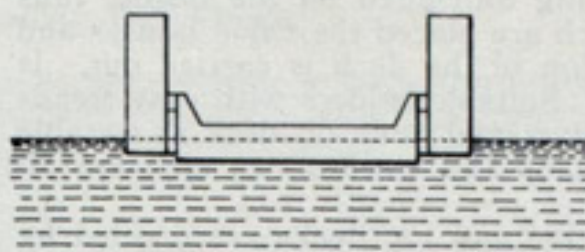


Fig. 1.

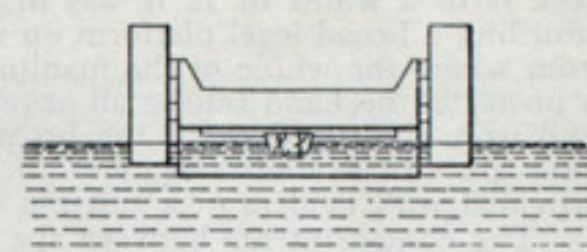


Fig. 3.

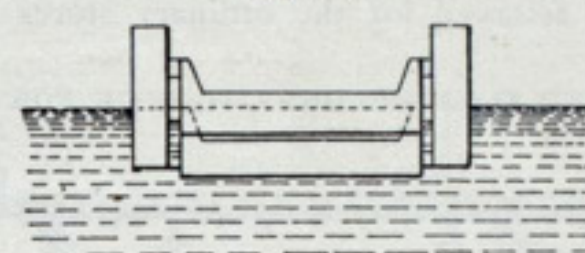


Fig. 2.



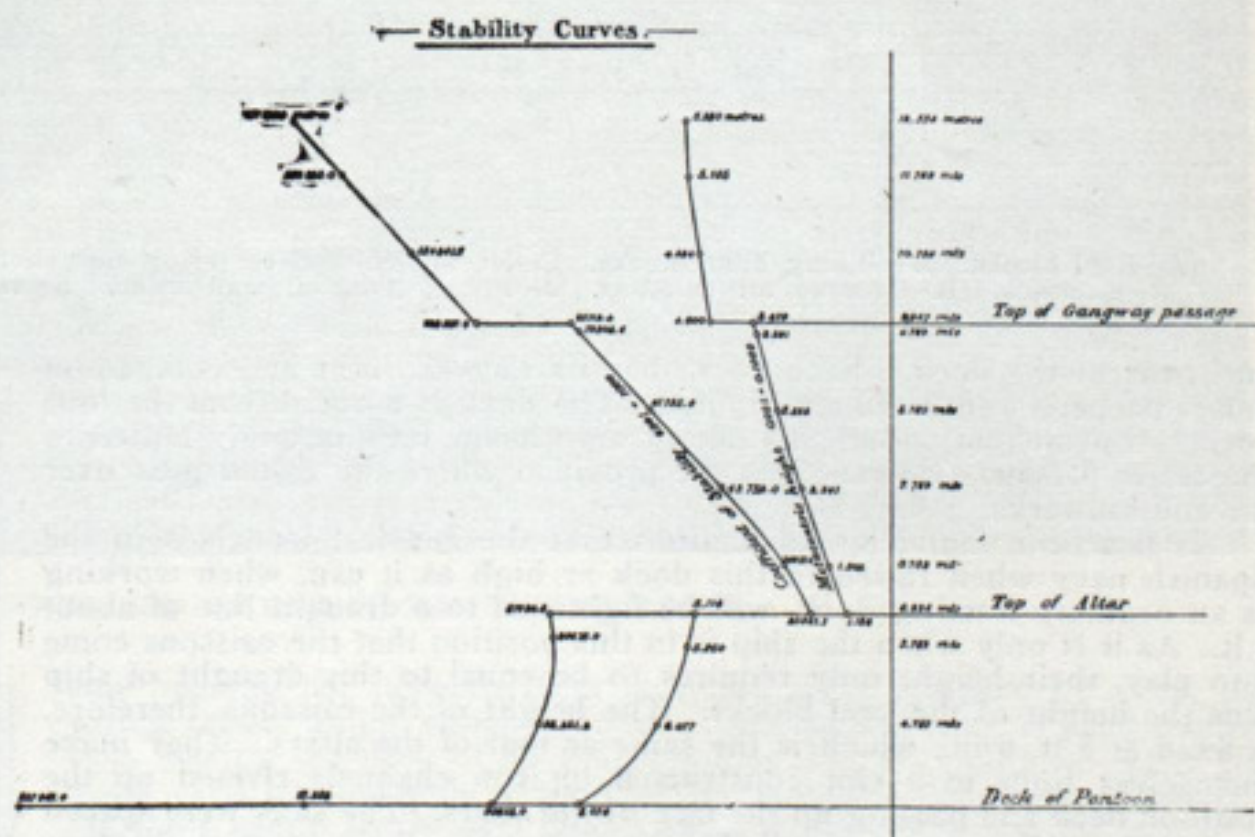
Fig. 4.

owing to the much greater area of the pound compared with that of the ship, the dock will have risen to a considerable extent, so that the tops of the caissons come well above the water line.

In lowering a vessel the exact converse takes place. The pound is allowed to fill until inside and outside water levels are the same. Water is then admitted into the interior of the dock, which then sinks, leaving the caissons floating. The lowering is continued until the ship floats again, when shores, etc., are removed and she is hauled out. The dock is either then ready to receive another vessel or can be pumped out until the pontoon deck comes above the water, and left until again required.

#### METHOD OF SELF-DOCKING.

The system adopted is a modification of that applied to a dock recently designed by the same engineers for the Mexican government. In order to follow the arrangement it should be first imagined that it is required to lift the pontoons in order to get at their bottoms. There are five pontoons, but for the purposes of repair either two or three alternate ones are dealt with together, as by this arrangement the dock always remains in equilibrium. At the same time if required two contiguous pontoons could be dealt with, the weight balanced by water. In the first place the dock is pumped out so as to bring it to its lightest draught line



(Fig. 1). Men then descend into the spaces between the walls and the pontoons, and remove the bolts that connect the pontoons that are to be docked so that they are left floating free on the surface of the water. The dock is then lowered, leaving these pontoons floating behind, until the decks of the remaining attached pontoons come about 3 ft. below the bottoms of the floating pontoons. In this position a fresh set of angles will be found riveted to the walls and the free pontoons are attached to these by the same fish plates and bolts that held them in their former position. When attached (Fig. 2) the dock is pumped out, and as it rises it brings with it all the pontoons, but those which are attached in the upper position will have their bottoms brought above the water level as shown in Fig. 3. Rafts can then be floated under them and every part got at for painting or repairing. When the painting or repairs are finished, the dock is again lowered to such a depth that the repaired pontoons are in a position to float again. They are then detached and left free, whilst the dock is raised again until it resumes its primitive position, when the pontoons are again made fast to the walls. The remaining untouched pontoons are then dealt with in their turn in an exactly similar



manner, so that in two operations the whole of the pontoons can be most completely and simply inspected or repaired in all parts.

Lastly there are the under-water portions of the wall to be got at. This is simply effected without removing any bolts by merely heeling the dock (see Fig. 4). As the bottom of the walls is normally somewhat higher than the bottom of the pontoons, it follows that the angle of the heel required is very small indeed, and is easily provided by allowing water to run into the compartments opposite to those that are to be examined.

The caissons themselves being separate structures can of course be got at at any time and in any way, being preferably lifted by the dock itself by being placed on the deck of the pontoons.

It will be seen therefore from the above description that each and every portion of the parts of the dock that are normally below water can at any time be easily got at for the purpose of inspection or repair, and that entirely without the aid of divers or any appliances whatsoever foreign to the dock itself.

#### MORE WORK FOR LAKE SHIP YARDS.

Two orders of the present week from Messrs. Hawgood of Cleveland increase to twenty the number of steel steamers under contract with the American Ship Building Co. for delivery next spring. Probably one of the vessels, building for W. H. Mack and others, will be delivered so as to make a few trips before the close of navigation this season. Of these twenty steamers seventeen are freighters and their combined capacity on 18 ft. draught is 91,900 gross tons. The aggregate value of the ships, including three passenger steamers, is \$5,585,000. In a despatch from Detroit a few days ago, Lyman C. Smith of Syracuse, N. Y., who has made a fortune out of the Smith-Premier typewriter, was quoted as saying that he intended to place an order for the construction of ten steel freighters for lake service. Mr. Smith was probably not fully quoted on the subject. Several weeks ago, W. H. Prime, who is well known in marine insurance circles, undertook with Charles Counselman, Chicago grain merchant, and with Capt. W. W. Brown of Cleveland, the formation of a company to build ten steamers. Capt. Brown has been associated with Mr. Smith of Syracuse in several large enterprises, and was to represent him in the negotiations with Messrs. Counselman and Prime. This was the ten-ship order to which Mr. Smith referred. The negotiations are still under way but have been delayed on account of the illness of Mr. Prime, who is confined in a hospital at Chicago. The order may yet be placed but probably for not more than half the number of ships first planned. In lists of new vessels for next year thus far published the names of parties for whom two of them are to be built have not been given out. The names are A. G. Tomlinson, well known vessel agent of Duluth, and Frank Seither of Cleveland, who is a large owner in the steamer V. H. Ketchum. These steamers are each of about 4,800 gross tons capacity and about \$220,000 cost. The two Hawgood steamers, for which contracts have just been closed, will probably be built at the Chicago works of the consolidation and will be larger than any of the vessels as yet ordered for next year—6,500 gross tons capacity each. They will be a little larger but in all other respects similar to the steamer Clarence A. Black, which has quite a reputation as an economical freighter. One is for Henry A. Hawgood and the other for Wm. A. Hawgood.

A Pittsburg company that controls oil property in Texas has purchased from Mr. A. B. Wolvin and others the steel steamer Paraguay and has made arrangements with the American Ship Building Co. to fit the vessel at once for carrying oil in bulk between Texas and New England points. The work will be done at the Lorain ship yard, under the supervision of Mr. Edward Gaskin of Buffalo, who has been interested in negotiations for the purchase of the vessel. The alterations will be finished early in October, so that the vessel may be taken to the seaboard without difficulty before the close of lake navigation. The Paraguay and a sister ship, Asuncion, were built by Mr. Wolvin and others about a year ago for seaboard trade. The Asuncion is now on the Pacific coast, but the Paraguay has been on the lakes this season in preference to the seaboard on account of more favorable freights in the lake trade. When alterations to be made in the Paraguay are completed at Lorain she will have twelve oil compartments of 800,000 gallons capacity; these in addition to a pump compartment forward and the regular engine and boiler compartment aft. An expansion trunk, extending the whole length of the vessel, will be fitted in addition to eight thwartship bulkheads and a cofferdam. The cofferdam, constructed just forward of the engine compartment, will be in reality two bulkheads, with space enough between them to admit of a quantity of water, so as to prevent leakage of oil to the boiler and machinery part of the ship.

The steamer Colonel, one of the two freighters on which the Detroit Ship Building Co. has been at work since early spring, left Detroit on her maiden trip Saturday. The other steamer will go into commission early next month. These two steamers, to be managed by Mr. A. McVittie, are distinctively Detroit ships, built upon the ideas of Messrs. McVittie, Kirby and Calder, from their knowledge of the operation as well as the construction of lake freighters. They expect great results from the Colonel and her sister vessel—from the standpoint of economy, of course. The Colonel as regards hull is a duplicate of the Gilchrist steamers Lake Shore and Gilchrist (5,400 gross tons capacity), but her engines are of only 1,000 H.P., yet it is expected she will make 11 miles loaded and 12 light.

The council of Collingwood, Ont., has fixed assessment of the Collingwood Ship Building Co. at \$25,000 for school purposes only and has granted it a lease of a dry dock for twenty-one years at a nominal rental.

Notwithstanding the fact that every ship yard on the Pacific coast is turning out lumber carriers as fast as they can be put together, there is still a shortage of tonnage, and freight rates are consequently stiff.

Rear Admiral Howison has been selected by Secretary Long to take the place of Rear Admiral Kimberly on the committee appointed to investigate the conduct of Rear Admiral Schley.

Low Rate Excursion to New York via B. & O.—Tickets on sale daily until Oct. 20 with privilege of returning via Buffalo. Call at city ticket office, 241 Superior street. Oct. 20.

#### TRIP OF RIVER AND HARBOR COMMITTEE.

Congressman Theodore E. Burton, chairman of the committee on rivers and harbors, has just returned with several members of the committee from a tour of the harbors of the United States outside of those of the great lakes and the northern Atlantic coast. The trip has been comprehensive and the fruit of the observations will be incorporated in the new river and harbor bill. Mr. Burton is not as yet ready to make a statement regarding the results of the trip but will make one later. He said:

"We left Washington June 3 and commenced our tour of inspection at Mobile. From there we went to New Orleans, Houston, Buffalo bayou and Galveston, Tex. From there we went straight to the Pacific coast, stopping at San Diego, Los Angeles, San Pedro, Santa Monica, Santa Barbara, Port Harford, Redmond Creek and then to San Francisco. We spent several days at San Francisco examining the harbor closely and other harbors and channels near at hand, notably at Oakland and the channel at Mare island, where the navy yards are located. We then visited the Sacramento river, Stockton and Marysville and went up the Yuba and Feather rivers. From Marysville we went to Portland, Ore., visiting the Willamette valley and the Columbia river to and including its mouth. We then spent some time in Washington, making our rendezvous at Seattle. From Washington a side trip was made to Alaska over the White Pass & Yukon railway to the headwaters of the Yukon, directly on the route to the Klondike. On the return trip we inspected the Snake river and that portion of the Columbia river between the mouth of the Snake and the mouth of the Willamette.

"The trip was an extremely laborious one, but wonderfully instructive, and made much easier by the remarkable cordiality shown us on the Pacific coast. We were supplied with every facility for inspection, and were magnificently received in the leading cities, such as San Francisco, Portland and Seattle."

#### AROUND THE GREAT LAKES.

It is announced from Detroit that water signals on the Smith dock and the Pittsburg Coal Co.'s dock in the Detroit river will hereafter show depth of water at the Lime-Kilns up to 18 ft. 6 in.

As far as can be learned last year's record of 7,446 gross tons of ore moved in a single cargo has not been exceeded thus far this season. The steamer James J. Hill delivered 7,248 tons at Conneaut a few days ago.

Alexander Staley, chief engineer of the steamer Pueblo, died on Friday at Elgin, Ill., after an illness of several weeks, aged about forty-four years. His home was at South Milwaukee. He was a member of the Marine Engineers' Beneficial Association.

Barry Bros. of Chicago have purchased in New York for lake service the army transport Terry. She is 220 ft. long, 40 ft. beam and 13 ft. depth of hold. Her tonnage is 1,338. The Terry was formerly known as the Hartford and ran in a line on the Atlantic coast until she was purchased by the government for an army transport at the beginning of the Spanish war. The price paid by the government was \$170,000. The Hartford will run between Chicago and Muskegon, taking the place of the State of Michigan.

The old schooner, Smith & Post, acting as a light-ship on the south-east shoal of Point au Pelee passage, was burned to the water's edge and sank out of sight on Wednesday morning. The fire is supposed to have started in the vicinity of the boilers. The crew, consisting of Thomas Wilson, keeper, his son Norval Wilson, and William Roach, were rescued by the Anchor line steamer Codorus and taken to Cleveland. The Smith & Post was chartered by the Lake Carriers' Association early in the summer and converted, by the addition of a boiler, whistles and lamps, into a light-ship. She was towed to her station about six weeks ago, replacing a gas buoy which formerly marked the shoal. The schooner was built at Oakville, Ont., in 1866 and was 117 ft. long, 25 ft. beam and 11 ft. deep. She was owned by H. C. Doville and others.

#### TORPEDO BOAT DESTROYER VIPER A TOTAL WRECK.

The torpedo boat destroyer Viper, the first of her class to be fitted with Parsons turbine engines, has been totally wrecked on the rocks off Alderney island in the English channel. The boat struck during a fog, which set in while she was chasing destroyers of the opposing maneuver fleet. The Viper fired signals after she struck but the other vessels did not heed them, believing that the firing was part of the maneuvers. The crew did their utmost to save the vessel, but a racing tide caused the anchor cables to part and compelled the crew to abandon her in small boats. A French fishing smack, acting as a pilot, helped the crew to reach the shore. The Viper was running at 20 knots when the fog set in. She was then eased down to 5 knots and was running at that speed when she struck. Later when her cables parted her stern smashed on the rocks. Subsequently she parted amidships.

The Viper was the fastest vessel afloat, having on repeated tests under severe conditions made more than 40 statute miles within an hour. On her builder's trials she exceeded 35 knots and later in rough weather she maintained an average of 34.25 knots. She fully realized the expectations that were based upon the performance of her diminutive predecessor, the Turbina. Although only 210 ft. long, 21 ft. beam and 12.6 ft. draught, the Viper's engines developed more than 10,000 H.P., which equals the driving power of some great ocean liners. Absence of vibration and economy of coal consumption were chief among the little torpedo boat destroyer's good qualities.

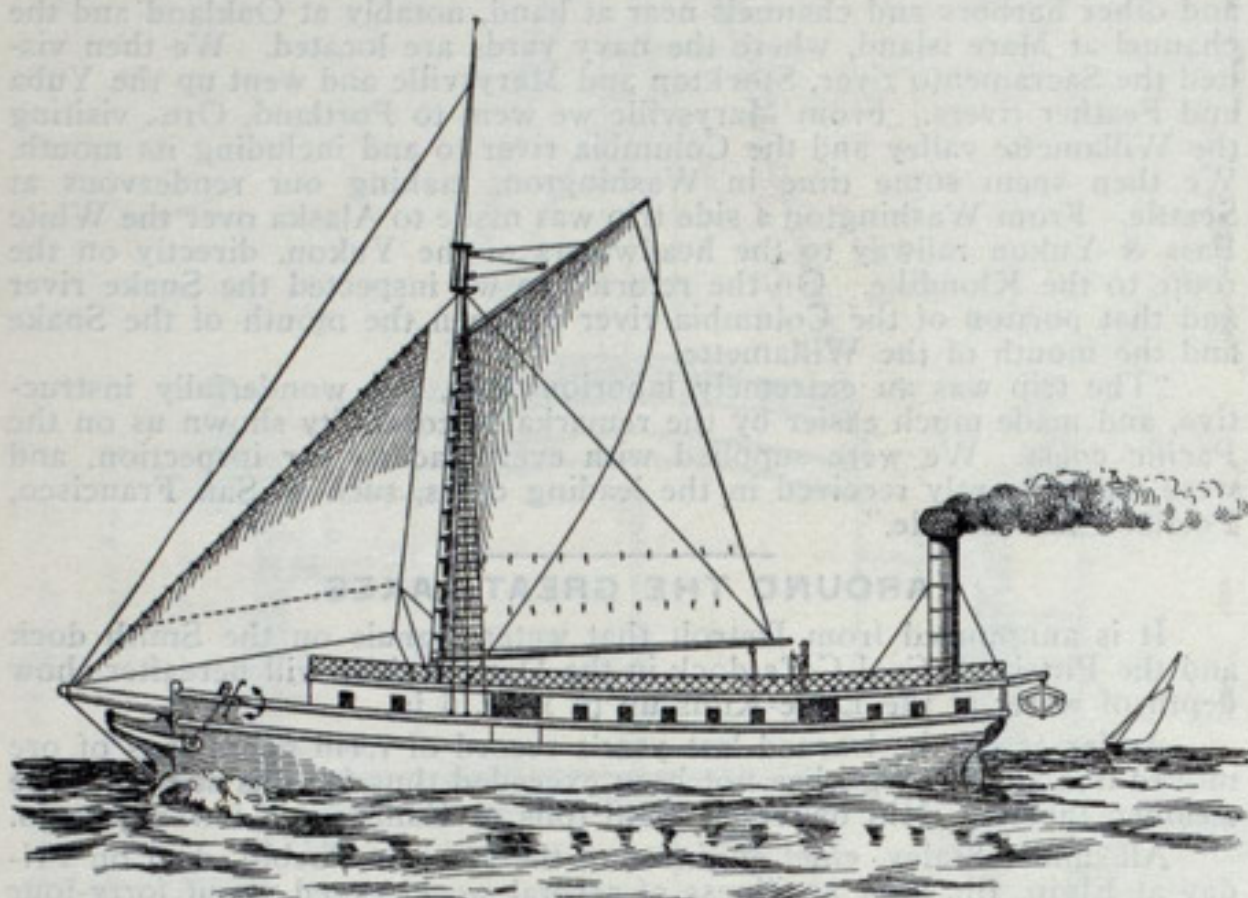
A very large number of competent judges of fast vessels on the great lakes are of the opinion that the Arnold line steamer Iroquois, built by the Craig Ship Building Co. of Toledo, can show speed equal to if not greater than the crack side-wheelers City of Erie and Tashmoo, which raced on Lake Erie several weeks ago. The Iroquois, alike to her sister-ship, the Chippewa, is certainly a very fast vessel, as was demonstrated in the brush she had with the Tashmoo up the Detroit river and Lake St. Clair on her maiden voyage. It is to be hoped that opportunity to bring the vessels together will soon occur, under conditions that will not admit of contradictory statements. Speed developed by the Arnold vessels has done a great deal towards directing attention to the Roberts type of water tube boiler, with which they are both fitted and which has been highly successful in them.



## PIONEER SCREW VESSELS OF THE LAKES.

MR. SAMUEL R. KIRBY DESCRIBES AND ILLUSTRATES VESSELS ON WHICH HE SAILED—SKETCH OF THE RAMSEY CROOKS—INTERESTING EVENTS OF EARLY DAYS.

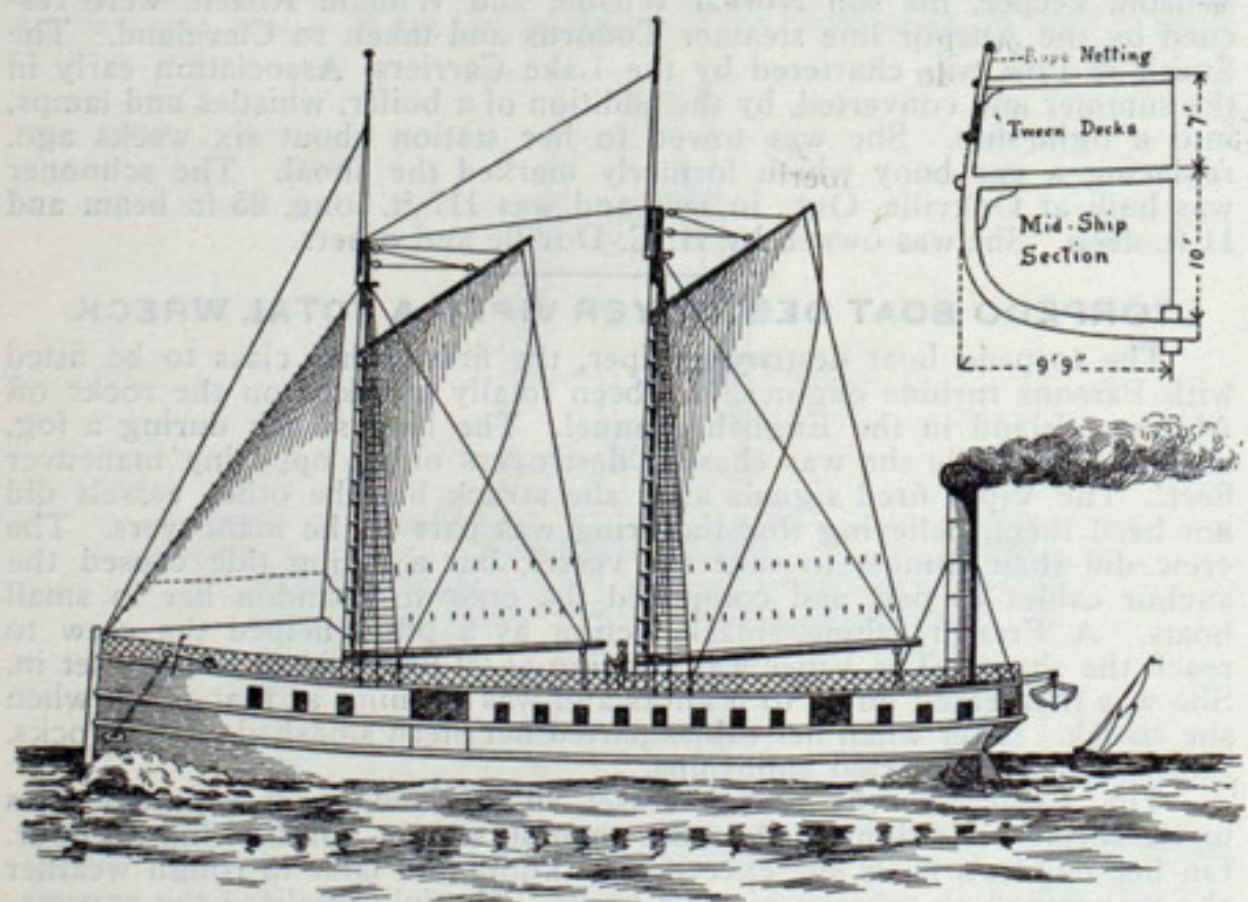
During the past two weeks the Review has received from Mr. Samuel R. Kirby of New York, father of the Kirbys who are so well known in ship building circles, some invaluable data regarding the early vessels on the great lakes. It wishes that many of the old vessel men would emulate the example of Mr. Kirby and send to it their recollections of early times. There is no more interesting subject to vessel men than this. It has the



Vandalia, 1839-40. Dimensions, 95 ft. over all; 80 ft. keel; 19½ ft. beam; 10 ft. molded depth. She was the first screw boat built on the Great Lakes. She was first intended for a sail vessel, but altered to a screw boat before she went into commission—in fact before she was launched.

importance of history and has undoubted value in that it shows vividly the evolution through which the lake region is passing. Mr. Kirby's first letter is devoted to the pioneer screw boats of the lakes and is as follows:

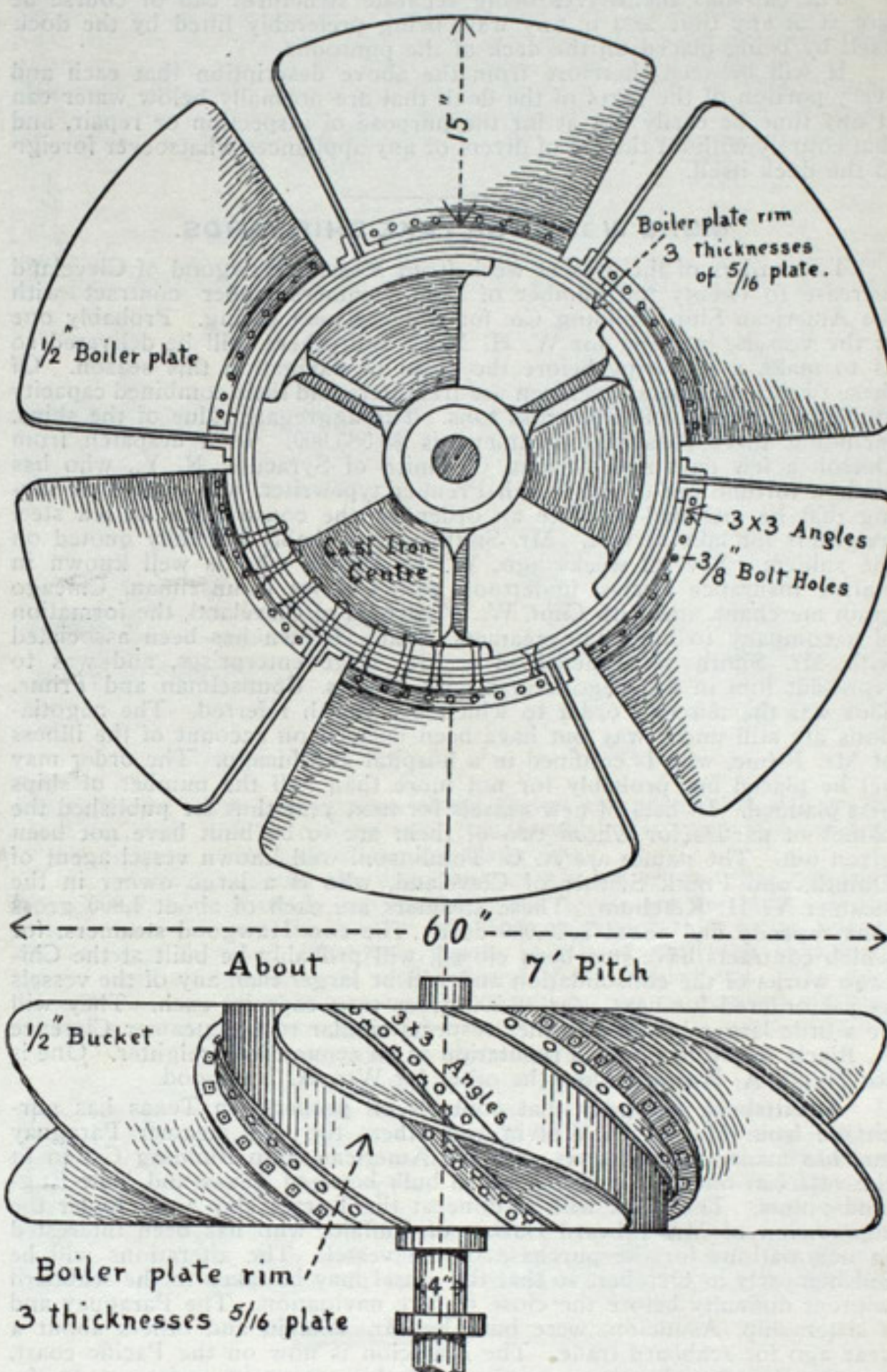
"Thinking that perhaps you would like to see and hear something about the pioneer screw boats on the lakes, I enclose you some pen sketches of the very first boats which were fitted out with screws. I resided in Oswego when these hookers, as the boys called them, were built, and afterwards during the seasons of 1845 and 1846 was chief mate of the Chicago. We traded between Cleveland and the Sault. This was during



Twin-screw boats Chicago and Oswego. Built in Oswego, N. Y., 1840-41. Dimensions, 95 ft. over all; 19½ ft. beam; 10 ft. molded depth; capacity 150 tons on 8 ft. draught; speed 7 knots in calm weather. At the time these ships were built the Welland canal locks were 100 ft. long, 20 ft. wide and 8 ft. deep on sills.

the excitement caused by the discovery of copper on Lake Superior. By the way, it was in the fall of 1846 that we chartered the Chicago to the Indian payment commission who were paying the Indians at the Sault, to take them to Mackinaw and thence to Green Bay. While on this voyage or when we were on our way back, we were signalled when off the mouth of the Menominee river, which is the boundary between Wisconsin and Michigan. We ran on shore and found that a party of government surveyors wanted passage to Mackinaw or to Milwaukee. We concluded to take them to Milwaukee, where we thought a good freight could be obtained for Buffalo. The party consisted of William A. Burt and eighteen men. They had been all the season surveying the boundary line and also running preliminary lines necessary to survey the upper peninsula of Michigan. They reported that iron ore was abundant all along the south shore of Lake Superior, causing great disturbance to the compass

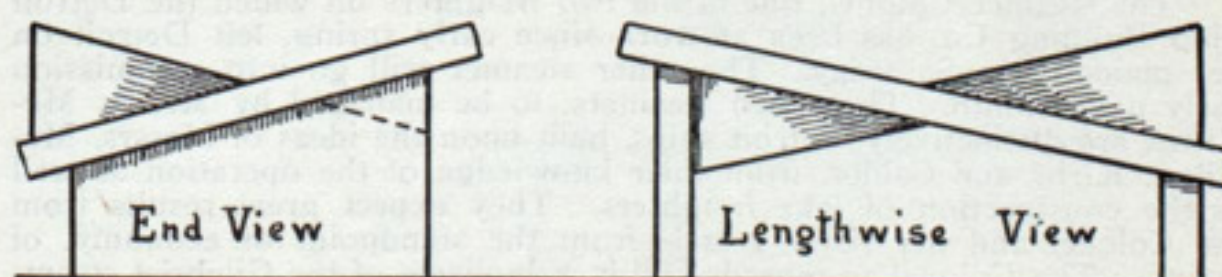
needles (hence the discovery).\* After reaching Milwaukee we fixed up our ship and took on board 4,000 bushels of wheat at 24 cents a bushel, plus twenty tons of pig lead and a dozen casks of potash, at equally good prices. We had a good run to Buffalo and back to Cleveland for winter quarters. This ended my having anything more to do with the pioneer screw ships. These ships burned wood for fuel, twenty-five to thirty cords being taken on board every thirty-six to forty hours. It was piled on the upper deck from end to end of the ship, the watch on deck passing



PLAN OF SCREWS OF THE VANDALIA, CHICAGO AND OSWEGO, 1839-40-41.

it down to the fireman from time to time during the watch. This occupied them nearly all the time on deck—one man steering and all the rest amusing themselves handling wood. No coal was used in those days. In fact coal was not used until about 1852 and not generally until about 1857 or 1858."

The second of Mr. Kirby's letters is devoted to a description of the brig Ramsey Crooks of the American Fur Co., which was built in 1836, and also to other vessels contemporary with it. There will be found on



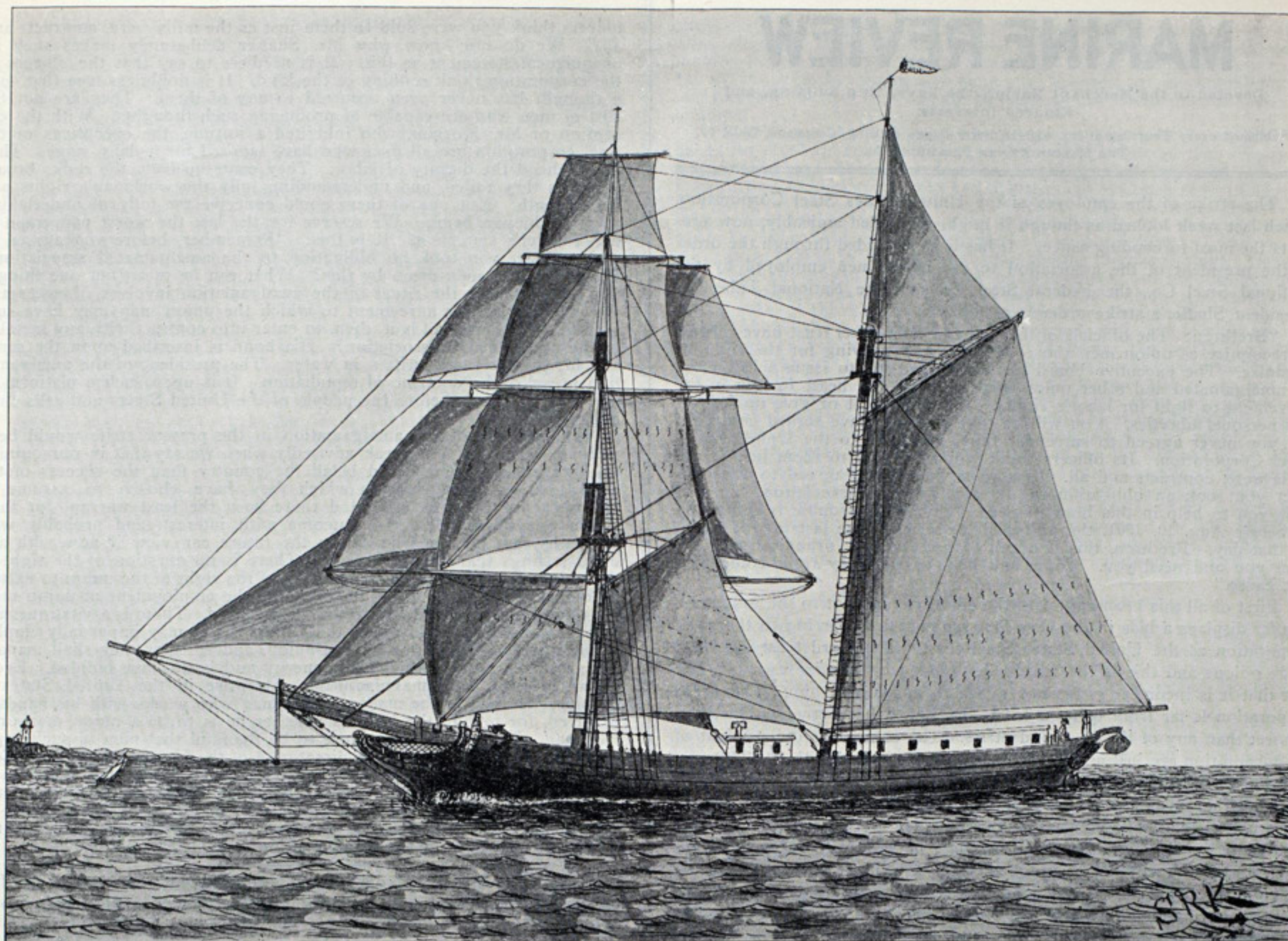
Cast iron former for shaping the buckets when bent out of shape. "About every port or wharf we visited," writes Mr. Kirby, "one or more of the screw buckets had to be refitted, put in true shape, shipped in place as best we could with water 2 to 3 ft. over the hub of wheel. This former was carried on board as part of the vessel's outfit."

the opposite page an illustration of the Ramsey Crooks, which is a faithful copy of an old sketch made by Mr. Kirby fifty years ago. As Mr. Kirby is now seventy-eight years old, this copy bears remarkable evidence of steadiness of eye and hand. Describing the vessel, Mr. Kirby says:

"I was two years on this ship, 1843 and 1844, with Capt. John and Capt. Orlando Woods. This ship was built in 1836, specially for the fur company's own business, and traded between Detroit and the Sault until 1850 when she was sold. The fur company dissolved after Astor's death

\*The discovery of the existence of iron ore was made at what is now Negaunee on the Marquette range in September, 1844, by William A. Burt and his surveying party, who were attracted to the deposits by the remarkable fluctuations of the magnetic needle. They were engaged for two or three years thereafter in running the boundary and township lines in the peninsula. Mr. Kirby must, therefore, have picked up the party during one of these later years and not in the year in which the actual discovery was made.—Editor.



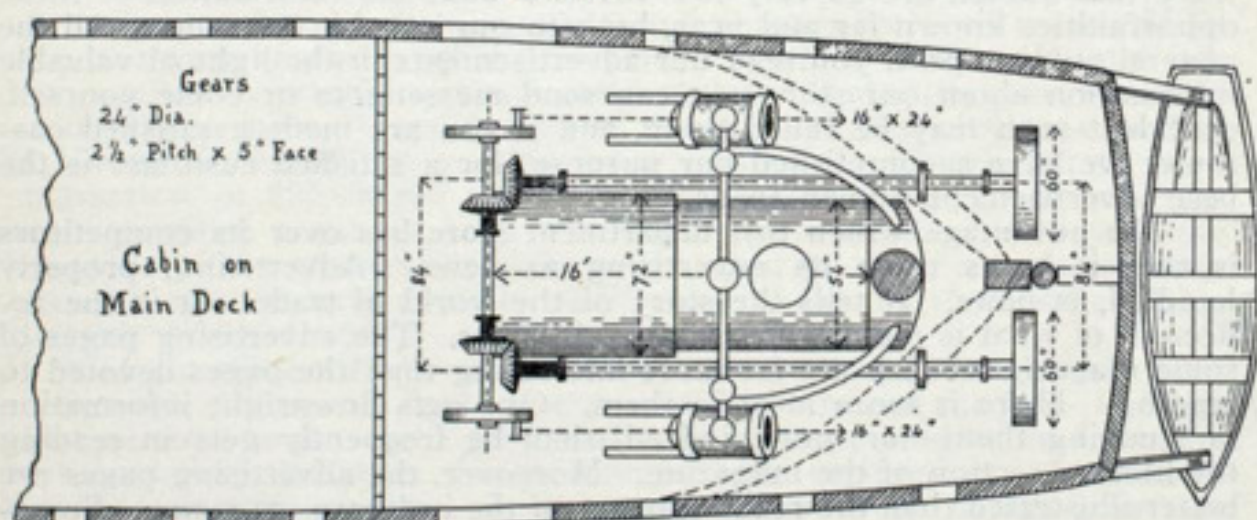


THE BRIG RAMSEY CROOKS.

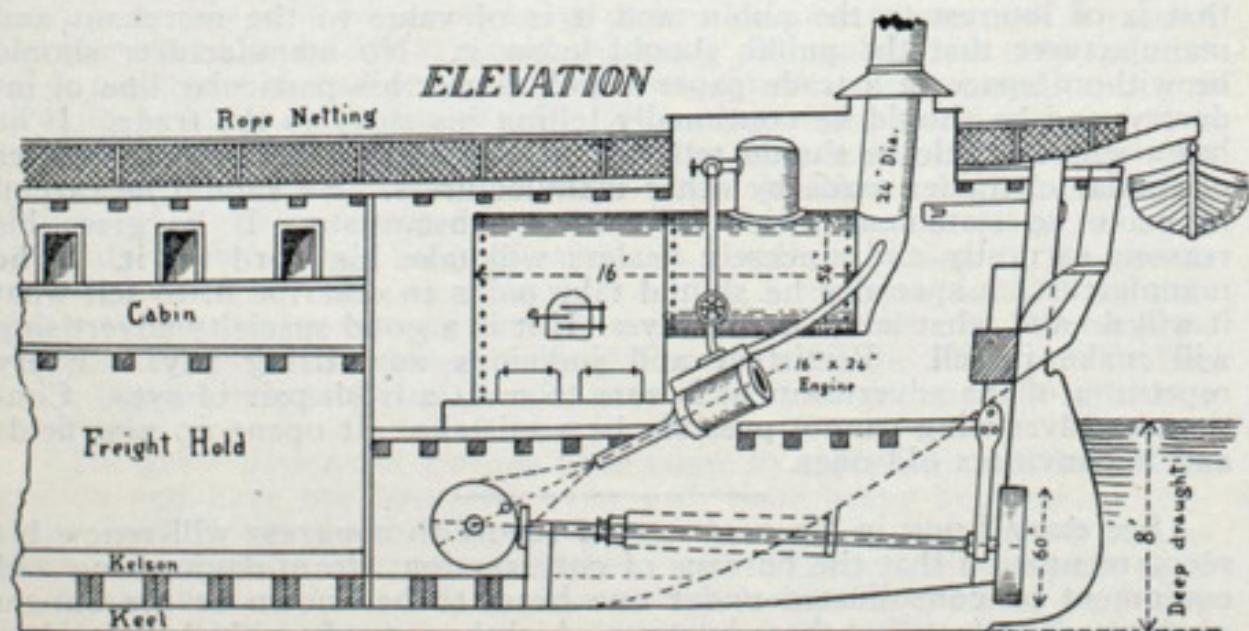
From a drawing by Samuel R. Kirby.

in 1848. This ship was first commanded by Capt. Ben Stannard. The chief mate was Chris Goulder, who, I think, was the father of Harvey D. Goulder of Cleveland, and John Wood was third mate. In the fall of 1837 or 1838 the Ramsey Crooks was caught in the ice 10 or 12 miles off Bar

## PLANE



## ELEVATION



SKETCH OF THE ENGINE AND BOILER LOCATION OF THE PROPELLERS VANDALIA, CHICAGO AND OSWEGO.

point at the mouth of Detroit river and laid outside all winter. She usually made a Buffalo trip in the fall before going into winter quarters at Detroit. She was an extra fine and very fast sailer. She was fitted for passengers in splendid style, having a ladies' cabin specially designed.

The cabin was entirely on deck, as shown, with caboose separate. She was about 100 ft. by 28 ft. by 9 ft., and of 247 tons measurement. The Crooks, after being sold, was lengthened 25 ft. and was in commission up to about 1860. I do not recollect how she ended her days. The top sail schooner John Jacob Astor on Lake Superior was built about the same time as the Crooks. They formed the line, Detroit to La Pointe and other places on Lake Superior. The Astor was fitted with quarter boats. She had to do all her work from her anchors—no wharves or piers to land stuff directly from ships existing in those days. The Astor was also fitted for passengers, the same as the Crooks. She was lost at Copper Harbor in the fall of 1845. We had previously carried up timber for a new vessel on Lake Superior to help the Astor, and men to build her, in 1844. This vessel was about the size of the Astor with fore-and-aft rig. She was launched in the spring of 1845 and named the Napoleon. She was commanded by Capt. John Stewart. Two years afterward she was converted into a propeller. She ended her days on St. Clair flats doing lighterage work to help vessels over the shoals in the north channel of St. Clair river. No government work had then been done to help the navigator."

## STATUS OF TURBINE ENGINES.

On the subject of turbine engines and their adoption in British warships, Mr. Arnold-Forster, replying to a question addressed to him in the house of commons recently, said: No conclusion has yet been reached as to the adoption of the turbine system of propulsion for vessels of his Majesty's fleet. Trials are now in progress with the Viper under service conditions, and in comparison with other destroyers. Much valuable information which will assist in reaching a decision as to further applications of the turbine system will thus be obtained. Experience with the Viper has shown that a higher speed can be realized with her turbomotors than can be obtained in a destroyer of similar dimensions and form fitted with ordinary engines. Vibration is practically avoided. It does not appear correct to say that the turbo-motor engines necessarily occupy less space than the ordinary reciprocating engines, but they require less vertical height, and therefore can, as the honorable member suggests, be more easily kept below the water line—an undoubted advantage. The total engine room and boiler room complement of the Viper is larger than that required in the 30-knot destroyers fitted with the ordinary engines, but the horse power developed at her maximum speed is greatly in excess in the former. Proposals with outline designs for fitting turbomotors in third-class cruisers and new types of destroyers are now under consideration. No decision has been reached respecting vessels included in this year's program. It is not contemplated at present to adopt the system in battleships or large cruisers.

Excursion to Atlantic City via B. & O. R. R., Thursday, August 15. \$13.50 round trip. Secure tickets at city ticket office, 241 Superior st.



# MARINE REVIEW

Devoted to the Merchant Marine, the Navy, Ship Building, and Kindred Interests.

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The strike of the employees of the United States Steel Corporation, which last week looked as though it might be settled amicably, now presents the most foreboding aspect. It has been extended through the order of the president of the association to the union men employed by the National Steel Co., the Federal Steel Co. and the National Tube Co. President Shaffer's strike order is as follows:

"Brethren: The officials of the United States Steel trust have refused to recognize as union men those who are now striving for the right to organize. The executive board has authorized me to issue a call upon all amalgamated and other union men in name and heart to join in the movement to fight for labor's rights. We must fight or give up forever our personal liberties. You will be told that you have signed contracts, but you never agreed to surrender those contracts to the United States Steel Corporation. Its officers think you were sold to them just as the mills were, contracts and all. Remember before you agreed to any contract you took an obligation to the amalgamated association. It now calls you to help in this hour of need. Unless the trouble is settled on or before Aug. 10, 1901, the mills will close when the last turn is made on that day. Brethren, this is a call to preserve our organization. We trust you and need you. Come and help us and may right come to a just cause."

First of all this is an appeal to the emotions and not to the judgment. Shaffer displays a bias in the very first sentence by referring to the great corporation as the United States Steel trust. The word trust has been made odious and this is the reason doubtless why Shaffer uses it. The fact that it is incorrect seems not to weigh at all with him. The great corporation is far from being a trust. In fact, it has fiercer competition to meet than any of the great industries. The companies independent of the corporation are just as powerful as those associated with it. The corporation's companies are a little less vulnerable than most and that's about all the advantage which they have; but in this particular instance it is a matter for public congratulation that they are less vulnerable. We don't quite know what Shaffer means when he says that the corporation "has refused to recognize as union men those who are now striving for the right to organize." The corporation has recognized them to the extent of paying them a better wage than the union schedule and it has not sought to interfere with the union or its legitimate growth. It has very naturally declined to cultivate the growth of unionism, but it has thrown no obstacles in its way. Shaffer's statement that they must fight or forever give up their personal liberties is nonsense. The corporation is not seeking to interfere with the personal liberties of any man. He is as free to think and to act as he pleases so long as he does not trespass upon the right of others. The personal liberty of the employe is not questioned by the corporation but it seems to be most seriously interfered with by the amalgamation itself. The amalgamation would deny to a workman the right to work—a right which is inherent, sacred and unimpeachable. Is this not a most unwarranted interference with personal liberty? It seeks, moreover, to destroy individualism, which is the very base of personal liberty. It is destructive of ambition and it prevents men from attaining that to which their natural qualities give them title. Charles M. Schwab would never have been the president of the Steel Corporation had he joined a union and followed present-day union methods after he became an employe of the Carnegie company. Not that Mr. Carnegie would not have had him, but that the union, by destroying his individuality, would have prevented his advancement. This is one of the worst features of unionism. It puts all men upon a level and it makes the worthy support the unworthy. It prevents a really skilled man from getting all that he earns in order that someone else may get more than he earns.

Mr. Shaffer also manifests that moral turpitude which distinguishes so many unions in their attitude toward contracts. They don't seem to understand that a contract is a moral obligation. It should be all the more binding upon the employe, because he has given nothing to secure it; the corporation secures it with every dollar of its tangible property. Yet Shaffer blithely says: "You have been told that you signed contracts, but you never agreed to surrender those contracts to the United States Steel Corporation." The United States Steel Corporation is merely a convenient vehicle wherein a number of underlying companies agreed to merge their interests and to accept the stock of the corporation in exchange for the stock of the underlying companies. The underlying companies did not lose their identity. They exist today as entities just as much as they ever existed. The corporation in accepting the stock of the underlying companies and giving in exchange therefor its own stock assumed all the contracts and obligations of the underlying companies. It has not sought to repudiate any of them. The contracts given to the underlying companies by the union men are just as binding today as they were the day they were written. They are not altered either in spirit or in letter or in law. The force of this would appeal to Mr. Shaffer were the corporation to seek to break these contracts. He would be the first to denounce it as a legal outrage and a violation of faith and he would be as clearly right as he is now clearly wrong. It is strange that he does not perceive the untenable nature of his argument, and stranger still, its gross injustice. But let us continue. He adds: "Its

officers think you were sold to them just as the mills were, contracts and all." We do not know why Mr. Shaffer deliberately makes such an unequivocal statement as this. It is needless to say that the officers of the corporation think nothing of the kind. It is doubtless true that such a thought has never even occurred to any of them. They are not the sort of men who are capable of producing such thoughts. With the exception of Mr. Morgan, who inherited a fortune, the executives of the steel corporation are all men who have worked for a daily wage. They comprehend the dignity of labor. They came up from the ranks broadening as they toiled, and understanding fully the workman's rights and his strength. Not one of them could conceive the folly of undertaking to sell a human being. We reserve for the last the worst paragraph in Mr. Shaffer's statement. It is this: "Remember, before you agreed to any contract you took an obligation to the amalgamated association." What does the man mean by this? What can he mean but one thing—that obedience to the ritual of the amalgamation involves, if necessary, the violation of any agreement to which the union man may have subscribed. Of what avail is it, then, to enter into contract with any member of the amalgamated association? His bond is inscribed upon the sands and his promises are written in water. The president of the amalgamation preaches the doctrine of repudiation. It is upon such a platform as this that he stands before the people of the United States and asks their indorsement.

The success of the amalgamation in the present strife would be a national calamity. We speak advisedly when we say that in our opinion no greater misfortune could befall the country than the success of the amalgamation. The position which they have chosen to assume is tyrannical in the extreme. Had there been the least warrant for their action one might view the outcome with interest, and probably with sympathy, but no one who judges the future can view it now with any other feelings than those of alarm. There is no question of the right of the union to exist; there is no question of the right of the union to extend its offices; there is no question regarding the employment of union men. All these were conceded before they were asked. There is a vital question as to whether the employers of the United States may impartially employ labor, whether it be union or non-union, and whether they shall manage the great institutions which their energy and brain have built. Every dollar invested in a manufacturing enterprise in the United States is deeply concerned in the matter; every man who works with his hands is involved, for to him the issue is whether he is to be a union man or a free man. The country has cause to be thankful that men of such capacious intellects as compose the directorate of the United States Steel Corporation are managing the conflict. They have fought many battles in their time and they are not likely to surrender this one. The fight should be fought to a finish. Success is necessary to preserve the integrity of the industrial life of the nation. Of that there is sufficient evidence in the call of the president of the amalgamation.

One of Boston's big department stores recently published the following in the midst of its large display advertisement in the Sunday local papers:

"Many customers have said to us 'Why do you advertise continuously? We always come to your shop when we desire to buy goods.' We believe that is true with thousands of our patrons, particularly the large number who have charge accounts, but we wish to increase this long list and our announcements of new articles and fabrics opening frequently are intended as a source of information from time to time of what is particularly new and desirable, as well as what is exceedingly reasonable in price. Many lots have to be disposed of at a great loss on account of excessive stock, injudicious buying or change of fashion. At such times the prices quoted are so very low that we want the information of these opportunities known far and near, both to our regular customers and the general public. So if you read our advertisements in the light of valuable information about our store you can send messengers or come yourself, confident such may be relied upon, and if you are made a satisfied customer we have accomplished our purpose, for a satisfied customer is the best advertisement known to us."

The advantage which this department store has over its competitors is that it looks upon its advertising as news. Advertising, properly handled, is news. It tells the story of the world of trade. It is the reflection of what is moving in commercial lines. The advertising pages of some magazines today are far more interesting than the pages devoted to reading. There is more meat in them. One gets downright information in studying them—far more, indeed, than he frequently gets in reading the literary section of the magazine. Moreover, the advertising pages are better illustrated than the reading pages of the ordinary magazine. Something happens every day or every week in a business house or factory that is of interest to the public and it is of value to the merchant and manufacturer that the public should know it. No manufacturer should be without space in a trade paper which covers his particular line of industry, and he should be continually telling his story to the trade. If he has a staple article he should tell why he considers it better than articles of similar character made by other manufacturers. He should be careful to make no statement which he cannot substantiate. If he gives his reasons earnestly and sincerely dealers will take his word for it. If he manufactures a specialty he should take pains to describe it, to tell what it will do and what labor it will save. If it is a good specialty advertising will make it sell. Persistent and judicious advertising pays. Every repetition of the advertisement is sure to meet a fresh pair of eyes. Continuous advertising cannot possibly be a mistake. It opens up new fields and it convinces old ones.

Secretary Long in his next annual report to congress will renew his recommendation that the bureaus of construction, steam engineering and equipment be consolidated under one head, to be known as the bureau of ships. The fact that these bureaus which have to do with the complete construction of a ship are under separate heads has much to do with the discord and friction which prevails in the navy department. It extends to every ship yard in which a government ship is building, because each bureau has its own special representative there. The three departments overlap and it is almost impossible to determine where one begins and the other ends. This makes a situation over which three jealous admirals can find plenty of opportunity to quarrel.



**EL SIGLO LAUNCHED AT NEWPORT NEWS.**

Newport News, Va., Aug. 7.—The Morgan line steamship *El Siglo* was launched at the yards of the Newport News company last Saturday. The day was an ideal one for a launching and the big hull went off at high tide without a hitch under the direction of Mr. M. V. D. Doughty, the superintendent of construction. Lieut. Com. Robert Usher of the United States navy christened the vessel. *El Siglo* is a 5,000-ton freighter, sister to *El Dia* and *El Valle*, launched earlier in the season, and is intended for service between New York and New Orleans. She is 406 ft. long. Among those who witnessed the launch were Com. Inch, U. S. N., senior inspector of machinery; Lieut. Com. Quimby, U. S. N., inspector of ordnance; Com. W. A. Stahl, U. S. N., superintending naval constructor; Naval Constructor George F. Rock, U. S. N.; Lieut. Com. Usher, U. S. N., the Illinois' executive officer; Lieuts. Miner, Kaiser and Pickrell, U. S. N.; J. B. Millar, inspector for the Morgan line; George H. Ferguson, inspector for the Pacific Mail line, and Assistant-Superintendent A. L. Hopkins of the ship yard.

The lake-built steamer *Simon J. Murphy*, which has come to be one of the moving landmarks of the Atlantic, is now at the ship yard for a thorough overhauling before starting on her long voyage to San Francisco. The *Murphy* has been under charter to the Coastwise Steamship Co., which handles most of the coal going coastwise out of this port, but her owners have just sold her to the M. S. Dollar Co. of San Francisco and hereafter she will be known as a lumber ship. The *Murphy* will be placed in the new dry dock this week.

The Pacific Mail steamer *Korea*, the largest vessel so far constructed in this country, has been in the new dry dock the past week. The time for the *Korea's* departure for the Pacific is not distant. It is rumored that the Pacific Mail will charter the *Korea* to New York parties for an around-the-world excursion tour, the new leviathan taking the party by the Mediterranean and Pacific ports to San Francisco where the excursionists will take a train for the return trip across the continent.

A board of naval officers is expected here shortly to inspect the various departments of the ship yard. The board was appointed by Secretary Long to inspect all of the large and well-equipped yards with a view of securing information and data which can be used in the plans for the proposed naval station in the Philippines.

The new propeller *Virginia*, building at Richmond for the Chesapeake & Ohio route between Newport News and Norfolk, will be launched this month, but the date has not been set.

Now that the navy yard across the Roads at Portsmouth has been made one of the torpedo boat stations, it will be necessary to build another warehouse and make some other improvements to care for the delicate little flyers, the disposition of which has caused the navy department heads some little anxiety. In another week all of the officers for the United States battleship *Illinois* will be here, ready to enter upon their duties with the commissioning of the splendid battleship. Capt. G. A. Converse, Lieut. Com. Robert Usher (executive officer), Lieut. Com. Richard Henderson (navigating officer), and some of the other officers, as well as warrant and petty officers, are already here. The crew for the *Illinois* is now being assembled on the training ship *Vermont* at the New York navy yard.

**CAPT. HOBSON ON THE NAVY AND MERCHANT MARINE.**

Capt. Richmond Pearson Hobson, the young man who achieved considerable fame during the Spanish-American war by sinking the collier *Merrimac* in the mouth of Santiago harbor, delivered an address in Buffalo last week upon the subject, "The Needs of the American Navy and Merchant Marine." After reviewing what other navies are doing he said:

"While it is not advisable, in the face of rapid progress in naval warfare, to lay too far ahead the numbers and characteristics of vessels to be built, it is most important that provision be made positively, without fail, for a continuous program of new construction. Under the present condition of relative strength and in view of the ship building programs abroad, the United States should provide for a minimum appropriation for new construction of \$25,000,000 yearly for the next ten years. If congress should establish a rule of such a minimum appropriation each year the ship yards of the country could be relied upon to make a corresponding expansion and the navy could be relied upon to lay out the most effective programs of construction.

"Closely allied with the questions of a navy, indeed, inseparable from the question of the navy, is the question of the merchant marine. In huge organizations like those of a great nation provision should be made for the control of transportation commensurate with production. A nation's independence and greatness are not complete until the nation possesses the ships that carry its products to the distant markets over the seas, the question of this transportation being of so vital importance that it cannot safely be left in the hands of outside nations. It involves not only the saving of payments abroad and a proportionate increase in expenditures and activities at home, a matter of very large proportion, but it also involves the vital question of the protection of water-borne property. Americans pay annually millions to foreigners for ocean freights. And hundreds of millions of American property are carried under foreign flags and can look only to those flags for protection. A condition of war in Europe at any time would be liable to embarrass and in a measure destroy the efficiency of the ocean transportation of American products. We cannot look upon ourselves as independent of Europe until the important matter of the transportation of our products to their foreign markets is in our own hands.

"The great nations of Europe have come to appreciate this important question and have not hesitated, even with their heavy budgets, to contribute, in the form of subsidies, to the creation and maintenance of steamship lines, requiring in return that these lines organize and prepare their vessels and be ready for calls in case of war for auxiliary naval purposes. The United States, however, may almost be said to be without a merchant marine, and has exhibited an apathy toward the merchant marine parallel to the apathy toward the navy that followed the civil war. I will not go into the particulars of the causes that have brought about this deplorable condition—the disappearance of our merchant marine when it had been prior to the war the largest in the world. We are familiar with the blow that the war struck at this commerce and with the advent of iron ship building. Nor will I enter into particulars about the economic situ-

ation that apparently caused American capital and American men to seek other channels, nor to the part played by the subsidizing of foreign ship lines by foreign governments. I wish simply to call attention to the present situation, to the urgent and imperative demand for the upbuilding of our merchant marine and for the facilities at our command for such upbuilding.

"We can now build ships as cheaply as any nation in the world. Indeed, there is no reason why American ship building, like American bridge building and similar industries, should not lead the world. Nor do I admit that foreign companies can manage and maintain mercantile vessels better or more cheaply than Americans, for American methods of organization can be applied with as much advantage in this department as in the other departments of modern arts and industries. I believe, on the contrary, that in building and maintaining merchant ships, America has important advantages, and with equal chances, can become not only her own carrier, but the common carrier for the world's sea-borne commerce. As to the matter of subsidies, no one can question America's ability and I believe her willingness to compete with any foreign nations that endeavor through government aid to secure the world's carrying trade, and reap the benefits of the possession of a great mercantile marine. I believe that the question of the merchant marine and of the navy is beginning to receive the serious attention of the American people. I think they should go hand in hand and should be furthered by all thoughtful Americans. I see the conditions ripening and if I am spared to live to the allotted span of human life I expect to see the United States navy the largest navy in the world and the United States merchant marine the largest merchant marine in the world. I expect to see the day when our flag will fly from a myriad mastsheads, all over the face of the earth, when the inhabitants of all continents and all the islands of the sea will look upon that flag with reverence, with respect, with admiration, with love, and shall with one voice acclaim the American nation as blessed."

**OF INTEREST TO STEAM USERS.**

A circular from Messrs. Stuart & McCurdy, Drexel building, Philadelphia, deals with principles involved in the burning of coal in the ordinary boiler furnace by the use of steam forcing air therein. Messrs. Stuart & McCurdy are representatives of the Steam Boiler Equipment Co. of New York. The circular follows:

"Assuming first 4-in. pipe to carry full boiler pressure to load; assuming 1-in. pipe to carry full boiler pressure to furnace; equal to about 12½ per cent. in steam volume or quantity. Since the full boiler pressure is required to force the air into the furnace, it is evident that, in order to secure a refund of this 12½ per cent. of steam, it is necessary to effect an increase in the combustion of the coal to the extent of about 20 per cent., for the reason that the 12½ per cent. taken from the regular volume cannot be refunded complete, on account of the loss by radiation, linked to the loss through the stack. While the steam is 12½ per cent. complete when it is borrowed it is refunded incomplete, or minus the loss just referred to. As a general principle, the use of the steam is as broad as it is long. Practically in a furnace it is not as long as it is broad, and we must pick up this difference before we are even, or where we started. One cannot get something for nothing, or the world would be thrown out of balance. The truth of the matter is that in evaporating more water (not per pound of coal) to make a refund of the steam used in the furnace, you are doing it not by generating more heat units out of each unit of coal, but by generating heat units quicker and by their quicker accumulation and more rapid absorption by the water. The burning of more coal was required, not because perfect combustion, or carbonic acid gas, was attained, but because the process evidently is favorable to the generation of an undue quantity of carbonic oxide instead of carbonic acid gas—a difference in heat of 176 per cent. against the oxide. It must be borne in mind that the burning of coal is not a question of temperature. If it were, the heat units refunded by the use of the steam in the furnace would enable more of the combustible part of the coal to be burned and a large benefit would accrue. Temperature, in the sense to be conveyed is the ignition point. The question is one of mixture—two atoms of oxygen to one atom of carbon, the product of which is perfect combustion, or carbonic acid gas. Since the use of steam is about (allowed to accentuate the principle) as broad as it is long, we have nothing left but the mixture out of which to secure economy, and as forced drafts have always been conceded to be good steamers but poor economizers, we must place all such systems in the same category. Again, air is composed of four-fifths nitrogen and one-fifth oxygen, neither of which will absorb heat, but when heated to about 480° its volume, or bulk, is doubled in size; so that at 3,000° (the heat of the interior of the furnace) it has six times its original volume. It is, therefore, more unmanageable, and as its contained oxygen retains the same weight, its mixture with the gas becomes more difficult, although when mixed it can only do the same work. It would be much better to condense the air than to expand it."

Actual consolidation of the coke properties of the constituent concerns of the United States Steel Corporation was accomplished last week when the H. C. Frick Coke Co. became paramount in the coke operations of the Connellsville district. All of the coke properties of the Federal Steel Co. are to go into the Eureka Fuel Co., the largest coke concern in that company. All of the scattered properties of the American Steel & Wire Co. are to go into the American Coke Co., and all of the coke properties of the National Steel Co. into the Continental Coke Co. Thomas Lynch, president of the Frick concern, becomes president of all four companies, with O. W. Kennedy as general manager. The Frick company controls four-fifths of the production and acreage of the Connellsville district. The total number of completed ovens, owned and controlled, is 18,385 and about 1,000 are building.

In the work of starting a coaling station at San Juan, Porto Rico, the navy department will expend \$70,000. The first work to be done is the erection of two coaling towers and the machinery for handling fuel. Plans have also been completed for a coal storage plant at the Portsmouth (N. H.) navy yard, on which work \$100,000 will be expended. The plan is to transfer coal from vessels to shed by a movable tower and from the shed to vessels by gravity shutles. The newest machinery will be installed for this purpose with the idea that vessels may be coaled in the shortest possible time with the least manual labor.



## A BRIEF HISTORY OF OCEAN PASSENGER SHIPS.

BY LAWRENCE IRWELL.

(Continued.)

From Europe Australasia can be reached either by eastern or western routes—through the Suez canal, or round the Cape, or across the American continent. Besides the Peninsular & Oriental and other lines already named in connection with the east, there are lines whose principal or only business is in the Antipodes. Among the best known of these is the Orient line, which began operations in 1877. The present company was founded in the following year with monthly sailings, changed since 1880 to fortnightly services. The vessels go through the Suez canal and call at Colombo (Ceylon) on their way to Adelaide, Melbourne and Sydney. The Shaw, Savill & Albion Co. is the offspring of the amalgamation of two firms, whose history dates back about half a century. The company owns a dozen excellently fitted mail steamers, besides sailing vessels. They all make the outward voyage round the Cape of Good Hope, calling at Teneriffe and New Zealand, the time occupied being from forty-three to forty-four days. The homeward journey is taken by Cape Horn, call being made at Rio de Janeiro and Teneriffe. The return trip by this route occupies about forty days. One can therefore sail round the world by the Orient line in a little over eighty days. Sixty years ago the voyage to New Zealand occupied from 120 to 150 days; the clippers brought the period down to eighty or ninety days, and this has now been reduced by half.

The New Zealand Shipping Co. owns a fleet of fourteen steamers, engaged between New Zealand and London, calling at the Cape on the outward and at Monte Video (Uruguay) on the return voyage, thus circumnavigating the globe. In 1882 this company made the experiment of fitting up the sailing ship *Mataura* with refrigerators, and she took a large quantity of fish and birds from London to New Zealand, bringing back a cargo of frozen mutton, the cost of the latter freight being 5 cents per pound. This was the beginning of the frozen meat trade, previous to which the New Zealand farmers had reared sheep chiefly for the wool. Many of the carcasses of these animals were actually boiled down for tallow. The introduction of the frozen meat trade still further developed the exports of wool, and it has created a new business in England as a result of the importation of colonial cheese, butter and fruits. In this country, of course, there is very little room for imported food. The business of the United States is to export food. The passenger vessels of the New Zealand line, as well as those of the Orient and Shaw-Savill companies, are now fitted with refrigerating chambers. Some of the largest ships of the former company carry from 60,000 to 70,000 carcasses of sheep. At present those of the Shaw-Savill Co. carry an average of 50,000 carcasses each, and their entire fleet conveys to England more than 1,500,000 carcasses of mutton annually.

Mechanical refrigeration is, in reality, a much more simple process than is usually supposed. It has long been known that the compression of a liquid or a gas develops its latent heat into sensible heat. This, therefore, is what is done, whether the material is gaseous ammonia, liquid carbon dioxide, ether or air. The heat thus rendered sensible is removed by forcing the compressed substance through condenser pipes, over which cold water is allowed to flow. The next stage occurs in the refrigerator chambers into which the material, now deprived of heat, is introduced and within which it expands. During expansion its lost heat must be replaced by withdrawal from surrounding objects, and as the storage chambers are occupied by provisions, the heat is abstracted from them. The precise degree of cold required is capable of regulation and different classes of provisions are subject to different degrees of temperature. After the refrigerating agent has done its work in the storage chambers and has resumed its normal condition, it is taken back to the compressor, to pass through a renewal of the cycle.

## ROUTE ACROSS AMERICA TO AUSTRALASIA.

The other great route to Australasia is across this continent of North America. The Canadian-Australian Royal Mail Steamship Co., one of the younger lines, is jointly subsidized by the governments of Canada and of New South Wales. It affords an outlet for the traffic of the Canadian Pacific railway, and it gives opportunities for visits to the islands of the Pacific, at which travelers can land and remain until the return steamship calls. These vessels also are constructed to carry frozen meat. The Union Steamship Co. of New Zealand, which is termed "the American and Australian line," makes connection with the Union Pacific railway. This company owns twenty-one vessels which steam between San Francisco, New Zealand and Australia, calling at Honolulu, besides local services between New Zealand ports, Sydney, Melbourne, Hobart, Tahiti, and other South sea groups.

From Australasia we pass to Africa. More than 400 years have passed since Diaz sailed round the Cape with his two vessels of 50 tons each, manned with mutinous crews; more than a century has gone by since Great Britain took possession of Cape Colony. But the Africa of Livingstone, whose voyage to Cape Town in 1840 occupied three months, has been marvellously revolutionized by the great ocean steamships, which have now brought England and Cape Town within sixteen days of each other. Of these steamships there are many belonging to British, German and French companies. A New York and Cape Town service is about to be started by Donald Currie & Co., but the line will, we regret to say, be British, not American.

The East and West African ports and the islands off the coasts are well served by the African Steamship Co., the Clan line, the Natal line, the German East African, and the French Steam Navigation Co. The best known African lines, however, are the Union and the Castle. The Union Steamship Co. began its career in a humble way in 1853, as a coal-carrying concern. The outbreak of the war between England and Russia afforded opportunity for the Union company to extend its sphere, the five vessels which then comprised their fleet being chartered by the British and French governments. In 1857 the company was reorganized and completed a contract with the English government for a monthly mail service to the Cape. The mail contracts have been renewed from time to time and the vessels have been frequently employed for the conveyance of troops. The Union line has passed through various vicissitudes, financial and other, during its career, due in the main to the great fluctuations in the fortunes of South Africa. It has now a fleet of nineteen large steam-

ers of which the *Briton*, 520 ft. in length, is the largest vessel which goes to South African waters. Another vessel of this line, the *Scot*, was the subject of an interesting piece of engineering. In 1895 she was cut in two amidships by Harland & Wolff at Belfast, and lengthened by 54 ft. This operation added about 1,000 tons to her carrying power, and considerably increased her passenger accommodation. The Union line has a fortnightly mail service to the Cape and Natal; an intermediate service from Antwerp, Rotterdam and Hamburg to the South African ports and Delagoa bay; a third service from Southampton to African ports as far north as Beira.

The Castle line was founded by Sir Donald Currie in 1872. The mail contract has been equally divided between this company and the Union company since 1876. When the Castle steamers began to "run" postage from England to the Cape was one shilling (25 cents), and the duration of the voyage was more than double what it is now. There are eighteen Castle steamers, and two new ones in course of construction. Once a month a "Castle" starts for the islands of Madagascar and Mauritius. These ships call at Lisbon, Maderia, Las Palmas, St. Helena, Ascension, the Cape ports, Natal and Delagoa bay. Connection is made through the British India Co.'s steamships with Arabian ports, and the Eastern Archipelago; and through the Messageries Maritimes with Australia.

Among the routes which are frequented less by travelers than by traders are those which go to the West Indies and South Africa. The Royal Mail Steam Packet Co., incorporated sixty years ago, has a fleet of thirty-one vessels, which connect England and the Portuguese ports with Maderia, the Canary and Cape Verde islands, the West Indies and South and Central America. The main route is between Southampton, Cherbourg and Barbadoes; but the outward and homeward courses are separated by several degrees of latitude. The service is an extensive one, as it distributes the European mails at the Windward islands, Jamaica and the northern and eastern parts of South America, as far north as Buenos Ayres. The company has also a service of steamers in the Pacific between Panama and San Francisco, which call at many intermediate ports, the Isthmus of Panama being crossed by a railroad.

## OCEAN TRAVEL NOT CONFINED TO THE GREAT TRADE ROUTES.

Ocean transit has now come to embrace the byways of travel as well as the great trade routes. Places which half a century ago were visited only at long intervals by a few travelers bolder and more curious than their fellows are now included in the regular routes of the steamers of the great lines, or of their feeders. People go much farther for their vacations than their parents did, and the heat and dust of long journeys by rail explain the growth in public favor of the pleasure cruise. Ocean travel is very cheap; on an average the cost of saloon accommodations on the best steamers does not exceed 3 cents per mile. Luxurious surroundings, excellent food and ample attendance are thus provided at a price little above ordinary railroad rates. The development of extended pleasure cruises is a direct result of the improved accommodation of modern steamships. The so-called "grand tours" of years ago—whether in this country or in Europe—sink into insignificance beside the tours offered by the steamship companies, such as those extensively advertised by the North German Lloyd and Hamburg-American lines. The old railroad tours embraced the classic scenes of a part of the United States, or of Europe; the new ocean voyages include some of the lands and cities of the globe.

If we estimate distance by time, the world has been rapidly shrinking in dimensions since the beginning of steam navigation. One can put a girdle round the earth in less than eighty days by making rail travel alternate with that upon the sea. The choice of routes is continually extending. The world's steamship services are becoming so very numerous that there is hardly a port or coast town, however obscure, at which the great lines or their tributary feeders do not call. The ocean steamer of today—evolved by fifty years of the keenest competition—is an elaborate mechanism, a gorgeous and secure sea palace. Her vast proportions and admirable equipment are dwarfed only by her ocean setting. A volume would be necessary to do justice to her marvels. Yet we must glance at some of the more striking features of this triumph of the century.

On a modern steamship the engineers' staff is the largest part of the crew. The men engaged in the sailing department number only about one-third of those under the charge of the chief engineer. On the *Kaiser Wilhelm der Grosse* the engineers' department contains 216 men, 180 being firemen and coal trimmers. This ship has sixty-eight engines of all kinds on board, with 124 cylinders. On the *Oceanic* eighty firemen (or stokers) are required. There are, in addition, sixty coal trimmers, and about a dozen head firemen. The engineers number some two dozen, including, of course, those whose duty it is to attend to the refrigerating plant for the cold storage of provisions. The engineering department includes ten or twelve electricians and eighteen or twenty greasers for the engines and machinery. The engine power of the modern steamship is gigantic. The indicated horse power of the *Campania* or *Lucania* is 30,000. This amount of horse power is considered equivalent to that of 180,000 strong men, and the power of 30,000 horses is equal to the lifting of 441,964 tons one foot high per minute, or one ton 83½ miles high in a minute. It would be represented by the combined efforts of about forty large locomotives. Its exertion would be sufficient to lift the whole weight of the *Oceanic*—28,500 tons—to a height of 15 ft. in one minute.

Some idea of the capacity of the boilers which generate the steam required for the engine of an Atlantic greyhound may be gathered from the fact that those of the *Kaiser Wilhelm der Grosse*, when filled with the water they require, weigh 1,850 tons. The empty boilers in the *Oceanic* weigh 1,100 tons. To convey the smoke away from the furnaces the smokestacks have to be of enormous size. Their capacity is most impressive when they are seen lying in the ship builders' yard. A couple of the old street cars which horses pulled could be driven abreast through one of the funnels of the *Oceanic*. The two funnels of the *Lucania* are each 21 ft. in diameter and 120 ft. high—the height of many light-houses.

The modern steamship in the event of damage from without is



guarded by water tight compartments and double bottoms. These vessels have two hulls, one of them being contained from 4 to 5 ft. within the other. In the Kaiser Wilhelm der Grosse the double bottom is formed by an outer skin placed several feet away from the inner one, so that in the event of damage to the outer hull the inner plates would in most cases remain intact. This space of 4 ft. is filled with water ballast, used to replace the weight of coal burned during the voyage. Even if the inner skin should happen to become pierced there are still the bulkheads. These number eighteen in all, including the two engine rooms, and they extend through to the upper deck. Larger and smaller bulkheads alternate, so that no two large compartments are likely to be filled at one time. The boilers also are placed each in a water tight compartment, and injury to one would not affect the others. The safety of the Kaiser Wilhelm der Grosse is further guarded by an arrangement enabling the officer in command on the bridge to see whether the water tight bulkheads are closed or not; an electric annunciator on the bridge indicates the open or closed condition of each of these doors. For the purpose of drill they are closed every day at a different hour, the work being performed in about fifteen seconds. In case of a collision or of fire there are sufficient pumps on board the Kaiser to deal with 126,000 cubic ft. of water per hour.

The value of the great Atlantic steamships and the work involved in helping or saving them when they become temporarily disabled, is illustrated by the sums paid to those who rescue them from positions of difficulty and danger. When in 1890 the Paris was towed into port after the breakdown of her engines, \$30,000 was paid for that service. When the New York ran aground off Sandy Hook the expense of floating her was nearly \$100,000. The raising of the Germanic in New York harbor cost \$50,000.

#### PROVISIONING OF AN ATLANTIC VESSEL.

The provisioning of the Atlantic vessels is accomplished on a sumptuous scale. At no period has there been any stint in saloon fare on the first-class vessels; but with a large increase in the number of passengers carried the aggregate volume of provisioning has assumed gigantic proportions. The adjuncts, too, of service and surroundings have become more luxurious. Yet, though the saloon has always been well catered for, the steerage has not. At an early period the steerage fare on the clipper ships was so bad that the governments of several nations interfered, and insisted upon the companies providing for each adult passenger a minimum weekly allowance of raw food. To make matters harder steerage passengers had to cook their own food, and to provide plates, cups, knives and forks, etc. The companies provided the uncooked food and the bare berths—nothing else. All this is changed now, and changed for the better very considerably. The catering for the wants of a floating population of from 1,000 to 2,000 people is so efficiently done today that there is nothing suggestive of the sea about it. The stale weevil-eaten biscuits and the salt pork of ancient mariners, the lack of fresh vegetables, fresh meat, fruit and bread are no longer subjects of complaint. Cold storage and well-equipped cooking arrangements provide a variety of fresh food for every meal, not only for first and second-class saloons, but also for the steerage.

The modern merchant vessel of the highest class is an important adjunct to the navy of this country, Great Britain and Germany, the finest steamships being now kept in reserve for service in time of war. The utility of merchant vessels as armed cruisers was ridiculed not so long ago. According to the British system there are two classes of auxiliaries, namely, those which are directly subsidized at a fixed sum per ship per annum and those which are held in reserve by their owners without any additional payment, but as a part of the contract. For example, Messrs. Ismay, Imrie & Co. of the White Star line have informed the writer that they receive the small sum of 15 shillings (\$3.75) per ton for the retention of the Teutonic and Majestic. "This payment has amounted on the two steamers to £14,000 (\$70,000) per annum." In consideration of this subsidy and of a proportional payment for the Oceanic, the White Star line is required to hold five other steamships, having a total tonnage of over 42,000 tons, at the disposal of the British admiralty without any additional payment whatever. Compared with the subsidies paid by other countries, the sums paid by England are extremely small. Moreover, by subsidizing eighteen ships, she obtains the right to use fifty of the largest and finest ocean vessels in existence.

The use of armed mercantile cruisers originated with the late Mr. Ismay, managing director of the great line which owns the gigantic Celtic, and which will make her first trip from New York on Aug. 13 next. In 1885 he pointed out that in the event of the Suez canal being closed a vessel such as his firm proposed to build could land troops in India by way of the Cape almost within the same time as would be required to make the passage by the canal. Mr. Ismay's proposal was accepted, and the Teutonic, the first of her class, was built. This ship, typical of her successors, mounts twelve quick-firing Armstrong guns, eight on the upper and promenade decks and two on each turtle-back. The Teutonic can reach Halifax, N. S., from England in five days, and Cape Town in 12½ days. She can land troops at Bombay, India, coming from Liverpool via Suez, in fourteen days. She can reach Hong Kong in 21½ days, and Sydney, New South Wales, in twenty-two days.

During the war with Spain four cruisers belonging to the International Navigation Co. were requisitioned for service. It is almost unnecessary to say that they were the St. Paul, St. Louis, Paris and New York. The last two were originally Inman steamers. These ships were engaged as cruisers from April to September, during which time they suffered no accident, and the owners received the thanks of the president of the United States.

Although the British armed cruisers have not been put to a practical test, yet the best results may be confidently expected from these allies. The "smartness" of the officers, engineers and seamen on the great liners is largely due to the influence of the few months discipline to which they have been subjected in the navy. The reserves include officers and seamen, engineers and firemen. The two latter have never been popular branches of any European navy, and the great mercantile companies offer more attractions to some classes of men than do the governments. Engineers usually feel that they occupy a position subordinate to their real value as combatants. The modern battleship is simply a huge machine, and on the engineer and his staff must devolve the greatest responsibility in time of trial—an excellent reason why the modern merchant ships, which are the highest embodiments of marine engineering, should be the

training schools for the navy. Great Britain now has about 27,000 trained men of all classes—officers, engineers, seamen and stokers—ready to take their places in the navy in case of a naval war. While the United States do not require so large a reserve as this, the chief features of the British system are worthy of consideration.

It must be recorded as one of the greatest triumphs of modern naval science that huge steamships are built to satisfy the requirements laid down for armed cruisers without any sacrifice for the accommodation and comfort of passengers. The ordinary observer would notice little difference between the appearance of the armed cruiser and the usual type of mail steamer. The chief difference between them besides the gun arrangements, is that in the former the engines, boilers and rudder are placed wholly below the water line and are thus well protected. Ample capacity and great steaming power are essentials in an armed cruiser. The Oceanic, a cruiser, of course, has nearly 3,000 tons greater capacity than any other ship afloat, except the new Celtic, and she has far greater steaming power than any vessel in existence except the Deutschland. It was with difficulty that the early steamers could carry enough coal to last the Atlantic voyage. The Oceanic can store enough coal to take her round the world at a speed of 12 knots.

#### QUESTION OF FUTURE SPEED OF SHIPS.

The public, and some experts, are disposed to believe that, as the speed of ocean steamers has regularly increased, and records have constantly been broken in the past, the same process may be indefinitely continued. The early Atlantic vessels made passages of from thirteen to sixteen days; the same voyage now takes between five and six days. The time having been thus reduced by more than one-half in the course of sixty years, why should it be supposed that finality has been reached? This may seem sound reasoning at first sight. But sanguine persons who entertain the hope of a considerable reduction in the future of ocean transit do not clearly realize the conditions or the price which has to be paid for high speed. Approximately, the power required to propel a vessel increases in ratio of the cube of the speed. To double the speed, therefore, the power would have to be increased eight times. Any new marked advance in this direction is evidently not to be anticipated in the present condition of marine engineering. Engineers admit the possibility of great advances through the application and improvement of the steam turbine, but as yet these are only far off dreams.

The torpedo boat, which can travel half as fast again as an Atlantic steamer, is able to do so because everything is sacrificed to speed. The torpedo boat is occupied almost wholly by machinery, and this is very light. The weight of this machinery ranges between 35 and 70 lbs. for each indicated unit of horse power which is developed by the engines. But the machinery of a Cunarder, for example, weighs from 300 to 500 weights per indicated unit of horse power. The first has neither cargo nor passengers to carry; the last is a commercial venture depending upon these for success. The magnitude of the venture may be estimated from the fact that a Liverpool and New York steamer of the highest class must carry from 1,000 to 1,500 passengers and 2,000 to 4,000 tons of freight, besides her 2,000 or 3,000 tons of coal, and must earn about \$75,000 clear per trip before a cent of profit is made. At the same time passengers demand more and more room. The Lucania is given up so much to passenger accommodation that only 1,600 tons of freight can be carried, with the addition of 2,000 bags of mail.

Again, increased speed is accompanied by most unpleasant vibration. To reduce this to a minimum fast ships already have recourse to many expedients. The boiler rooms of the Campania have double casings, the space enclosed being fitted with a material which acts as a non-conductor of sound. A further increase of speed might easily make the vibration almost as intolerable as it is on a torpedo boat. Further, those who are sanguine concerning the probability of largely increased speeds fail to take account of the conditions which have facilitated the past increase in the rate of traveling. The reduction of time in crossing the Atlantic by one-half has occupied sixty years, which have been characterized by the most remarkable developments in the machinery of propulsion. Without such developments, these great advances in speed would not have been possible. There is good reason to believe that the sources of energy at present available, and the mechanical details of their transformation have now and for several years past been utilized to the utmost degree. Therefore, unless some further radical improvement in the machinery of propulsion occurs, no important increase of speed can be obtained. The truth lies in a nutshell—energy cannot be created, it can only be transformed. To produce a given speed a corresponding amount of energy must be stored up and utilized in the vessel. Coal contains the latent force, while the machinery forms the agency of utilization. To gain a little more speed would involve using much more coal; and this would mean a demand on space so disproportionate that there would not be enough room left to make a vessel a paying investment. It would mean turning a merchant ship into a sort of magnified torpedo boat. Already the consumption of coal is enormous, for it amounts to between 350 and 500 tons per day. And yet, although the total amount is very great, the actual proportion of coal consumed to the energy or horse power developed, is now so small that it seems impossible to reduce it further. The best ships do not burn 1½ lbs. of coal per unit of horse power developed per hour. The earlier steamers burned 5 and 6 lbs. per unit per hour; so that while the energy necessary for propulsion at the present speeds is about eight times that developed in the early steamers the coal required is only about one-third or one-fourth of what would have been required for an equivalent energy in earlier days. The Great Eastern was a failure, not because she was a big ship, but on account of the vast dead weight of coal which she had to carry. When the Great Eastern was afloat the marine engine was a weakling in comparison with its successor of the present day, and the boiler pressure was very low. The result was that the giant of former days required more than three times as much coal as a modern leviathan in order to produce a given degree of power. It is, therefore, tolerably safe to predict that no astonishing advance in the speeds of long-distance passenger ships will be made by the existing types of boilers or engines. Moderate advances in speed may, of course, be obtained.

But, although no marvellous improvement may be in store, we may well be content with what has already been accomplished. A wonderful advance in the art of building and equipping steamships has been made and the story of the advance has an interest peculiarly its own. Machinery,



steam and steel are not without their poetry. Romance has not disappeared from the seas with the white-winged clippers, nor will it disappear while the great steamers plough the waves, regardless of calms, hurricanes, tempests or icebergs. Safer and more comfortable than their predecessors, both for passengers and crew, they are one of the most remarkable mechanical products of the nineteenth century.

The number of steamships of upwards of 100 tons in the world today, taking the figures for 1900, is 15,898, with an aggregate gross tonnage of 23,369,358. About one-half of this aggregate is owned by Great Britain and her colonies. The number of steamers owned by Great Britain is 7,930, with a tonnage of 12,149,090. The number owned by the United States is 932—tonnage 1,454,965. Excluding the Leyland line, recently bought by J. P. Morgan & Co., the ships under foreign flags owned by United States citizens are the following:

**SHIPS UNDER FOREIGN FLAGS OWNED IN THE UNITED STATES.**

| Name of owners.                  | No. of vessels. | Gross tonnage. |
|----------------------------------|-----------------|----------------|
| International Navigation Co..... | 15              | 100,259        |
| Atlantic Transport Co.....       | 17              | 123,593        |
| Hogan & Co.....                  | 11              | 41,744         |
| F. E. Bliss.....                 | 8               | 30,602         |
| Chesapeake & Ohio Railway.....   | 6               | 20,279         |
| W. R. Grace & Co.....            | 5               | 16,499         |
| United Fruit Co.....             | 2               | 3,219          |
|                                  | 64              | 336,195        |

As to vessels in course of construction at the end of March of this year, 193,000 tons were being built in the United States, 232,000 tons in Germany and 1,303,000 tons in the United Kingdom.

This article would be incomplete without some special reference to American ships. The Great Northern Steamship Co. is having two of the largest cargo and passenger steamships in the world built for the trans-Pacific service. Actual work began in November of last year on the laying of the keels for these mammoth iron vessels at the works of the Eastern Ship Building Co., Groton (opposite New London), Conn. These vessels will be about 20,000 tons register and 33,000 tons displacement at normal draught, or just 10,000 tons more displacement than the Atlantic greyhound Deutschland. The new steamers, which are being built primarily for cargo carriers, are not so long as many Atlantic liners, but are much wider and deeper. The following are the principal dimensions of the ships: Length, 630 ft.; beam, 73; depth, 56 ft. Each of these steamers will have five continuous decks extending the whole length of the ship, with three additional partial decks amidships. The carrying capacity will be very great, for a cargo of 28,000 tons of coal can be transported. Passenger accommodation will be provided for nearly 1,000 persons, in three classes. These ships will have twin screws, triple expansion engines and water tube boilers. Although designed to be chiefly cargo carriers, they will have a speed of 14 knots an hour and will usually carry about 4,000 tons of coal in the bunkers. Although these steamers are intended to carry cattle, frozen meat and fruit they are constructed in such a way that they can convey any kind of freight which is offered for transportation. Each ship will cost about \$2,500,000, and both ships are intended to trade between the Pacific coast and oriental ports, in connection with the Great Northern railway.

Two other magnificent steamers of about 18,600 tons displacement are under construction at the Newport News (Va.) yard for the Pacific Mail fleet between San Francisco and Hong Kong, via Honolulu, Yokohama and Nagasaki as ports of call.

The American line is well known, even to the public, as the successor of the Inman line. The International Navigation Co., the proprietary organization, was incorporated in Pennsylvania in 1871. A fortnightly service was established in 1873 between Antwerp and Philadelphia with steamers under the Belgian flag, known as the Red Star line; and the American line was started with the American-built Illinois, Indiana, Ohio and Pennsylvania. In 1880 a weekly service was begun between New York and Antwerp, and this expansion was followed in 1886 by the important acquisition of the Inman line with its five steamers, and Liverpool connection. The years 1888 and 1889 witnessed the appearance of the City of New York and City of Paris, which vessels marked an advance in size as well as the adoption of twin screws. In 1893 the Inman & International, as the company was then called, underwent another phase of reorganization, and Southampton was made the English terminus, the names of the steamers being shortened to the bare title of the cities. The New York and Paris were, under a special act of congress, naturalized into the United States register, provided two steamers of no less size or speed were produced for their owners upon American soil. In 1895 the St. Louis and St. Paul emanated from the Philadelphia yards of Cramp & Sons to fulfill the conditions of the contract. Weekly New York mail trips are made to and from Antwerp and also Southampton, the latter departures calling at Cherbourg. Philadelphia passenger and freight lines are maintained to and from Liverpool, as well as Antwerp. Six new vessels are under construction, all of them of the twin screw type and from 10,000 to 12,000 tons each. Two are being built in an American yard, and four in British yards. The Paris is being rebuilt at Belfast, Ireland, and will in future be known as the Philadelphia. Steamship men all over the world, including many foreign competitors, wish all possible success to the American line.

**MINERVA AND HYACINTH'S TRIALS INCONCLUSIVE.**

Engineering of London, which of all the technical publications is disposed to be the fairest in its treatment of the Belleville boiler question, has the following to say regarding the recent trials of the Minerva and Hyacinth, the former of which was equipped with cylindrical boilers and the latter with Belleville water tube boilers:

"So far as can be judged by details already made public, the trials of the Minerva and Hyacinth leave us very much where we were in regard to our estimate of the value of the Belleville boiler for naval purposes. Former trials with vessels of the royal navy have shown that this type of steam generator can be worked with a fuel economy equal to that of the cylindrical navy boiler; and in many respects the Belleville boiler is superior to the older type. In fact, it may be said that, so far as trial-trip performance is concerned, and with everything tuned up to concert pitch, there is little to be learned by those who are not wilfully blinded by pre-

judice or self-interest. That the Belleville boiler is, in certain respects, superior for warship purposes to the navy boiler, which it superseded, is a conclusion we have come to as the result of observation; but our experience has not enabled us to decide on the question of durability. This is an important point upon which we have been always careful to reserve our opinion. But although the Belleville boiler—with the above reservation—may safely be pronounced superior to the old navy type, it is equally safe to say it is not the type that will last; indeed, there are water tube boilers already in the market that are its superior. Considering the importance of circulation in the working of a water tube boiler—in fact, more or less, in the working of all boilers—it is surprising how partial our naval authorities are to the horizontal tube type. In other navies we find vertical, or approximately vertical, boilers installed in large vessels, both cruisers and armored ships, with satisfactory results; but the royal navy, in making the one advance from shells to tubes, seems to have exhausted its enterprise; to be incapable of grasping the fact that in this practically fresh field of invention there must necessarily be ample opportunity for improvement; especially with so many capable engineers bending their minds to the subject.

"As we have said, the details published respecting the trials of the two cruisers have not added much to our stock of knowledge, but they appear to have been useful in silencing some of the most reckless and irresponsible critics of admiralty procedure. In fuel economy the Belleville boilers of the Hyacinth show to considerable advantage over the return tube boilers of the Minerva. According to an account contributed to the Times by 'a correspondent'—evidently an engineer—the water evaporation on the Hyacinth was effected at a much lower cost of fuel than on the Minerva. Three trials were made. The first was of twenty-four hours' duration and at one-fifth of the full power, namely, about 2,000 I.H.P. Here the Belleville boilers of the Hyacinth evaporated 9.69 lbs. of water for each pound of coal burnt, while the corresponding figure for the cylindrical return tube boiler was but 8.54 lbs. of water evaporated per pound of coal. That is a result of about 14 per cent. in favor of the water tube boilers. The next trial was also of twenty-four hours' duration, and was at half full power, or about 5,000 I.H.P. Here the advantage was still on the side of the Hyacinth, though not so fully marked. The Belleville boilers evaporated 9.41 lbs. and the cylindrical boilers 8.87 lbs. of water per pound of coal; or about 5 per cent. in favor of the former. The third trial was of twelve hours' duration for the Hyacinth and eight hours for the Minerva, the power being about 8,000 I.H.P. Here the water tube boilers exhibited a still more marked superiority, in spite of the important fact that their time of steaming was much longer than with the shell boilers. The water evaporated was 9.89 lbs. for the Hyacinth, and 8.19 lbs. for the Minerva for each pound of coal consumed, a difference of 20.7 per cent. A fourth trial at absolutely full power was on the program, but it was considered undesirable to force the shell boilers of the Minerva to their full extent. The Hyacinth's engines developed 10,181 I.H.P. for eight hours, the evaporation of water per pound of coal being 8.8 lbs. After these trials, 'certain modifications,' of a nature not stated, were made in the Minerva's boilers, with the result that the fuel economy was increased 9 per cent. This fact detracts from the value of the comparison throughout. One would have thought that enough was known about the working of cylindrical boilers to enable those of the Minerva to be brought up to their full efficiency before the trial commenced.

"The remaining trial was a test of the two ships rather than a trial of their respective types of boilers; although, of course, were the vessels absolutely identical in all other respects, the success of one would have meant a triumph for her boilers. Unfortunately, the ships are by no means identical in other respects. In the first place, the hulls are of different dimensions. They are both 350 ft. long, but the Hyacinth is 6 in. wider (54 ft. beam), and 4 in. more draught (20 ft. 6 in.). As the displacement is the same in both cases—5,600 tons—there is evidently a difference in model. The engines, too, necessarily differ, as those of the Hyacinth are designed to run at an initial pressure of 250 lbs. or 100 lbs. above those of the Minerva. The Minerva was designed for 9,600 I.H.P. at 140 revolutions, and the Hyacinth for 10,000 I.H.P. at 180 revolutions. The weight of the Belleville boilers of the latter is 461 tons, and that of the cylindrical boilers of the Minerva 557 tons. The Hyacinth has a more powerful armament than the Minerva, the weight saved by the lighter boilers of the former being devoted to giving her heavier guns, thus taking from the ship, in regard to speed, some of the advantage her water tube boilers should secure.

"The race home from Gibraltar to Portsmouth was a failure, due chiefly to fog. The Hyacinth got away half an hour before her competitor, owing to her getting up steam more quickly. After twenty-four hours' steaming she had an estimated lead of 9 nautical miles, and then ran into a fog, which caused both ships to ease to 8 knots. On the fog lifting, the Minerva steamed away with her engines developing 8,400 I.H.P., whilst the Hyacinth's machinery developed a 1,000 H.P. more. In spite of this the Minerva drew away at a rate which gave her an advantage in speed, stated to have amounted to 1.3 nautical miles per hour. As a test of boilers the race was evidently inconclusive. It is said that the Hyacinth, which made a three-hours' run at 10,000 I.H.P., gained no advantage in speed from her additional power, as 'she merely churned the water without appreciably increasing her speed,' and 'her 2,000 I.H.P. gives her no appreciable advantage.' Certainly 10,000 H.P. is a high ratio for a length of ship of 350 ft.; and one knows how rapidly the demand for power increases to get the last half knot or so; but the ships are not disproportionately broad, and one can hardly imagine that 6 in. variation in beam would make so great a difference. It is said, however, that at 7,000 I.H.P. the speed of the Hyacinth was 17.9 knots, at 9,400 I.H.P. it was 19 knots, and that only the same speed was reached when the engines were working at 10,000 I.H.P."

It is understood that the Kosmos Steamship Co., operating twenty-eight large steamships to various ports of the world, and with continental headquarters in Hamburg, is contemplating making Seattle the Pacific terminus of its fleet. The adoption of the plan will involve three distinct and separate steamship routes, two of which will terminate at Hamburg. One of these will be from Seattle via the Orient, the Suez canal, the Mediterranean and to Hamburg. The second will be via Central American and South American ports, the Straits of Magellan, the Atlantic and to Hamburg. The third line will be a direct service from Seattle to the Orient and return.



## TRADE NOTES.

One of the special features of the extensive manufacturing plants of the Wellman-Seaver Co., now in process of erection at Cleveland, will be a complete installation of the Sturtevant system of mechanical ventilation and heating, regarding which the builders have been instructed that the best possible equipment shall be provided for the comfort of the employees.

Toch Bros. of No. 468-472 West Broadway, New York, who make a specialty of damp-resisting paint and composition, are finding a very large demand for their products among ship owners and ship builders, as the paint and composition is best suited to ship purposes. In all their advertising, which is attractively arranged, they use the letters R. I. W., which mean "remember it's waterproof."

The J. W. Paxson Co., 1021 N. Delaware avenue, Philadelphia, manufacturers of foundry equipment and supplies, are conducting experiments at the works of the Cramps, Philadelphia, with Paxson-Warren sand blast apparatus for cleaning castings, in which important improvements have been made. Managers of foundries will be fully repaid for the trouble of writing this company for descriptive circulars dealing with modern foundry apparatus of this kind.

The Hyde Windlass Co. of Bath, Me., has closed a contract to supply windlasses for the two mammoth Great Northern steamships building at the works of the Eastern Shipbuilding Co., New London, Conn. These windlasses are of a new type, being an improved British liner vertical windlass with horizontal wildcats above deck and warping capstans operated by the windlass engine. These windlasses will be the largest ever made, the weight of each machine approaching 80 tons. The indicated horse power of the double engines will be 500.

Specialty is the order of the day in industrial lines as well as in the professions. With a renewal of activity during the past few years in wooden ship building in New England, and in new lines of trade offered to coasting vessels all along the Atlantic seaboard, Frank N. Tandy of No. 31 State street, Boston, has built up quite a business as a general marine agent. He gives special attention to marine investments and to the promotion of ship building enterprises. Just now he is assisting in the sale of shares in three wooden schooners of 2,500 to 7,000 tons capacity to be built for Captains J. L. Vail and J. G. Crowley, who are well known as managers of ships built in Maine.

The Badt-Goltz Engineering Co. of Chicago makes a specialty of marine electric lighting plants. Among vessels recently equipped by them are the United States government steamers Kappa and Henry Flad, lighted with direct connected generating sets, consisting of New York safety engines and 15 K. W. Milwaukee Electric Co.'s generators, and each provided with two 4,000 candle power search lights; also Mr. Seaver's (Chicago) 60 ft. gasoline launch, "The Kid," with generator, storage battery plant and search light. The search lights handled by this firm are manufactured by Charles J. Bogue, New York. They are unexcelled as to workmanship and material and can be relied upon for

continuous hard service. The standard lamps are provided with English mirror reflectors, but for lake and river service a less expensive silvered copper reflector may be substituted.

The ground for the new plant of the B. F. Sturtevant Co. at Hyde Park, Mass., is now effectually cleared of the various buildings which originally encumbered it, and displays more clearly the character of the location upon which will be erected the largest blower manufactory in the world. Through the rapid growth of the allied branches of manufacture which provide the engines and motors for fan driving, the new establishment will also rank among the leading manufactories in these lines. Over 8,000 Sturtevant engines are already in use, the blower record is fast approaching the 200,000 mark, while the work turned out by the electrical department of this company shows a similar increase.

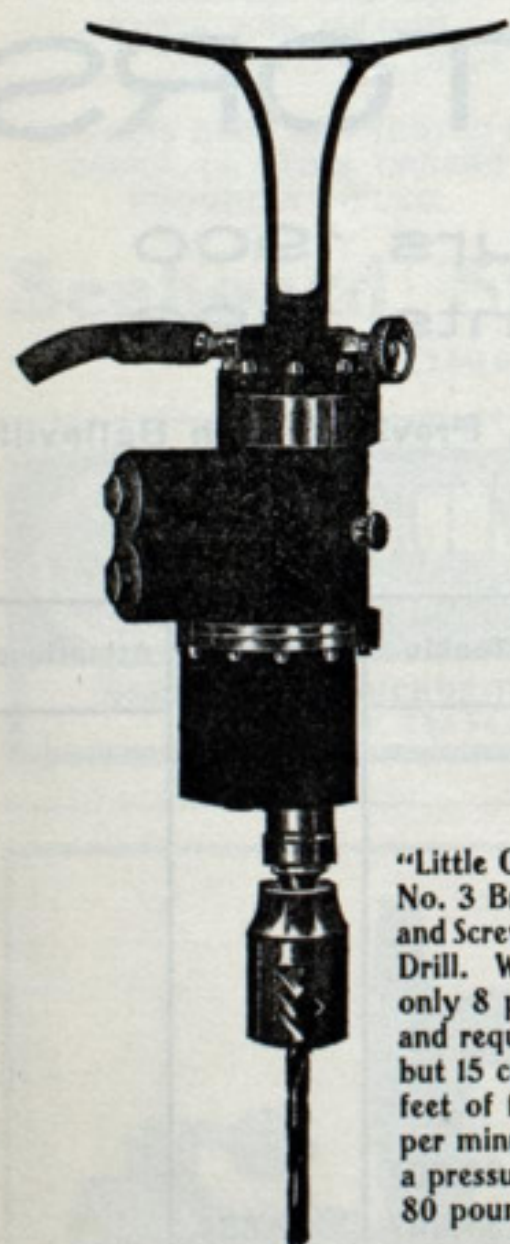
Some of the Chicago daily newspapers, not having a knowledge of the facts, have referred disparagingly to the efforts of representatives of the Steam Boiler Equipment Co. of New York to reduce, by the use of their system, the smoke nuisance from harbor tugs in Chicago, but the work is, of course, of a kind that requires care and experiment, and the equipment company, with the co-operation of the tug owners, is going to stay with it and is confident of success. Letters from Mr. Hovey, who is representing the equipment company in Chicago, show that he is not only confident of reducing coal bills and doing away almost entirely with smoke from the Chicago tugs, but also, later on, from tugs in various other parts of the lake region.

The United States Steel Corporation has just paid the first dividend on its preferred stock. It was a quarterly dividend of 1 3/4 per cent. and amounted to \$8,898,510. In addition interest amounting to \$4,800,000 was paid on the issue of \$304,000,000 worth of bonds. The dividends on the common stock become payable on Sept. 16. If the present rate on the preferred and common stock is maintained for twelve months, the stockholders and bondholders will receive more than \$71,000,000.

Theo. Audel & Co., publishers, No. 63 Fifth avenue, New York, have issued a book entitled "A B C of the Telephone," by James E. Homans, A. M. It is a complete elementary practical treatise for the non-technical reader. It contains 320 pages and fully 300 diagrams.

The 1901 catalogue of Marine Iron Works, station A, Chicago, is sent free on their receiving request. It is descriptive of their product, so far as the special line of work in which they are engaged can be catalogued.

Special local sleepers.—Train leaving Cleveland at 7:50 p. m. for Chicago, return trip leaving Chicago at 8:35 p. m., via the Nickel Plate road, now carries extra local sleepers between these points affording ample room for all. For specific information call on nearest agent or E. A. Akers, C. P. & T. A., Cleveland, O. 145, Aug. 17.



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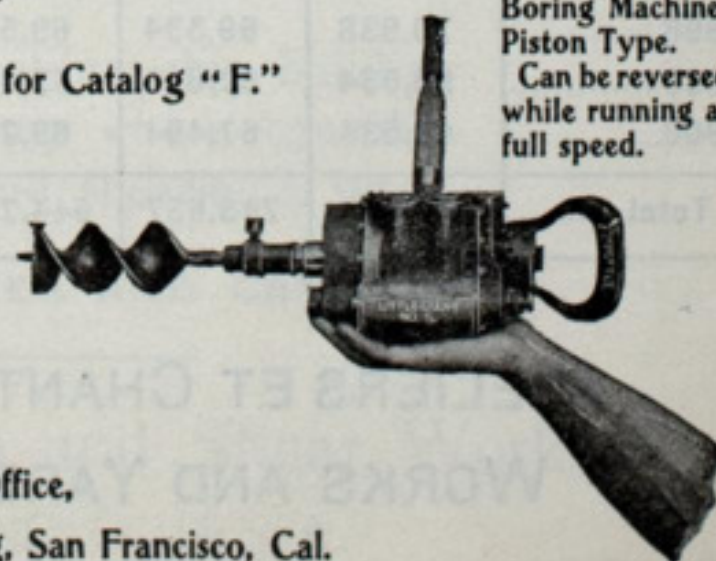
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## COAST SHIP YARD NOTES.

A Mobile (Ala.) correspondent says that F. M. Codina, who has been building and repairing tugs and small vessels at that point, is gradually building up a yard that will undertake the construction of almost any kind of wooden vessel. He has under way at present a tug of 62 ft. length and 12 ft. beam and which is to draw about 5 ft. Another tug, the Lapwing, built recently for Mobile parties, is 42 ft. over all, 15 ft. beam and 7 ft. depth. The hull is of juniper and cypress, with galvanized fastenings throughout, making a very staunch vessel. The compound engines, having cylinders of 12 and 22 in. diameter with 12 in. stroke, were built by the Morris Machine Works of Baldwinville, N. Y. A surface condenser used in the tug is of the Wheeler type. The boiler was made by Richardson & Goddard of Mobile and is 7 by 11 ft., Scotch type. The tug is used for towing purposes on Mobile bay and river, and with 125 lbs. steam turning a 6-ft. wheel she makes 11 miles an hour. The coal capacity is about 20 tons.

The new Clyde line steamship Arapahoe sailed last week on her maiden voyage to Charleston and Jacksonville. She is 310 ft. long, 46 ft. wide and 31 ft. deep, and has a speed of 15 knots and a cargo capacity of 3,000 tons. Like her sister ship, the Apache, the new vessel is admirably arranged and handsomely decorated. The Clyde line now has seventeen ocean going steamships, besides a large fleet of other craft. It is rumored that the company contemplates a further extension of its service to southern ports in the near future.

Washburn Bros., Thomaston, Me., launched last week the four-masted wooden schooner Joseph G. Ray. Her dimensions are: Length over all, 204 ft.; keel, 190 ft.; breadth, 40.3 ft.; depth, 19 ft. The Bath Iron Works, Bath, Me., built the engine and patent steering gear. The windlass, capstan, castings and blocks came from Knowlton Bros., Camden, Me. The Ray is owned by the Washburn Bros. and parties in Boston and Franklin, Mass.

Alabamaport, a town thirty miles south of Mobile on the gulf of Mexico, has been selected as the site for the new ship building plant of the Gulf Coast Ship Building & Dry Dock Co., of which Mr. Robert C. Morris is president. The company will construct a large dry dock, which it is expected will pay interest on the entire investment, owing to tonnage seeking dockage at New Orleans.

The Iowa Iron Works, Dubuque, Ia., has contracted to build a steel hull car transfer ferry boat for the Louisiana-Mississippi Railroad Co. of New Orleans. She will have a double track on deck with a capacity of sixteen cars. The vessel will be 303 ft. in length, 52½ ft. in beam and 7 ft. 9 in. depth of hold.

Kelley, Spear & Co., Bath, Me., have launched the wooden barge Newport. She is for service between New York and Taunton, Mass. The barge's dimensions are: Keel, 150 ft.; beam, 32 ft.; depth, 8 ft. She was built for the Staples Coal Co. and is the thirty-second barge built

for this company by Kelley, Spear & Co. and the 109th craft to be launched from that yard.

At Hitching's ship yard, Hoquaim, Wash., the steamer Olympic was launched recently. She was built for the E. K. Wood Lumber Co. of San Francisco and others. Her dimensions are: Length of keel, 190 ft.; breadth, 42 ft.; depth of hold, 14 ft. 6 in.; and she will carry 800,000 ft. of lumber.

The steel schooner yacht Thistle, building by the Townsend & Downey Ship Building & Repair Co., Shooter's Island, N. Y., was launched last week. The Thistle was built for Robert E. Todd. She was designed by H. C. Wintringham and is a modern deep-keel craft, 144 ft. over all.

The four-masted wooden schooner Gamble, built on Puget Sound for Pope & Talbot of San Francisco, has been launched. She is the largest vessel ever built at Gray's harbor and has a capacity for carrying 1,000,000 ft. of lumber. She is 210 ft. long, 40 ft. in breadth and 14 ft. deep.

The name of the steamer M. S. Dollar, which was the first vessel to be constructed by the New York Ship Building Co., Camden, N. J., has been changed to J. M. Guffey. Mr. Guffey bought her from Robert Dollar of San Francisco to use in the oil trade.

The clipper fishing schooner Regina, building at Oxner & Story's ship yard, Essex, Mass., for W. J. Emerson, was launched a few days ago. She is 122 ft. long, 25 ft. beam and 11.7 ft. deep.

Cobb, Butler & Co., Rockland, Me., launched last week the four-masted wooden schooner Joseph M. Haskell. Her dimensions are: Length, 226 ft.; breadth, 43 ft.; depth, 24 ft.

Gratts & Reimers, South San Francisco, Cal., are building a wooden steamboat for A. Hatt of Napa, Cal. She is 136 ft. long, 36 ft. beam and 7 ft. 6 in. depth of hold.

Neafie & Levy, Philadelphia, will probably launch the torpedo boat destroyer Bainbridge Aug. 10, and the Chauncey and Barry will follow soon.

On Aug. 15 the Maryland Steel Co., Sparrow's Point, Md., will launch the Whipple, Worden and Truxton, torpedo boat destroyers.

The Wolff & Zwicker works, Portland, Ore., will be offered for sale about Sept. 1, having been closed by order of the receiver.

The Johnson Iron Works, New Orleans, La., has under way two steel tugs for the Southern Pacific railway.

The J. N. Robins Co., Erie basin, Brooklyn, N. Y., will lengthen the Clyde line steamer Iroquois 50 ft.

Buffalo and return \$3.70, via the Nickel Plate road every Tuesday and Saturday. Three-day limit. Inquire of nearest ticket agent or E. A. Akers, C. P. & T. A., 189 Superior street, Cleveland, O. Tel. Main 218. 144 Aug. 31.

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Originated 1849

Hors Concours 1900  
Latest Improvements 1896

Number of Nautical Miles made each year by Steamships of the Messageries Maritimes Co., Provided with Belleville Generators—Since their Adoption in the Service.

| Year.      | Australien | Polynésien | Armand Béhic | Ville de la Ciotat | Ernest Simons | Chili   | Cordillère | Laos    | Indus   | Tonkin  | Annam  | Atlantique |
|------------|------------|------------|--------------|--------------------|---------------|---------|------------|---------|---------|---------|--------|------------|
| 1890.....  | 67,728     | 2,460      |              |                    |               |         |            |         |         |         |        |            |
| 1891.....  | 68,247     | 68,331     | 204          |                    |               |         |            |         |         |         |        |            |
| 1892.....  | 68,247     | 68,403     | 69,822       | 23,259             |               |         |            |         |         |         |        |            |
| 1893.....  | 68,379     | 68,343     | 68,286       | 68,247             |               |         |            |         |         |         |        |            |
| 1894.....  | 68,439     | 68,367     | 68,574       | 68,439             | 37,701        |         |            |         |         |         |        |            |
| 1895.....  | 68,673     | 68,766     | 68,739       | 68,808             | 40,887        | 28,713  |            |         |         |         |        |            |
| 1896.....  | 69,534     | 92,718     | 69,696       | 69,549             | 62,205        | 63,153  | 40,716     |         |         |         |        |            |
| 1897.....  | 68,250     | 69,606     | 92,736       | 69,555             | 62,235        | 76,110  | 63,357     | 43,146  |         |         |        |            |
| 1898.....  | 70,938     | 69,534     | 69,552       | 69,597             | 62,526        | 63,240  | 63,240     | 62,553  | 63,954  | 22,707  |        |            |
| 1899.....  | 69,534     | 69,615     | 67,431       | 90,405             | 60,246        | 62,778  | 62,868     | 52,344  | 54,855  | 44,007  | 22,884 |            |
| 1900.....  | 69,534     | 67,494     | 69,744       | 69,564             | 61,719        | 62,382  | 62,502     | 51,471  | 53,373  | 62,016  | 63,066 | 52,140     |
| Total..... | 757,503    | 713,637    | 644,784      | 597,423            | 387,519       | 356,376 | 292,683    | 209,514 | 172,182 | 128,730 | 85,950 | 52,140     |

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**EXAMINATION FOR REVENUE CUTTER SERVICE.**

An opportunity will soon be offered for bright young marine engineers to obtain a life position in the government service. The opportunity in question will be an examination for the position of second assistant engineer in the United States revenue cutter service. There are at present two vacancies, and those who do not obtain the highest averages, but pass satisfactorily, will be placed on an eligible list, and will be available for subsequent vacancies. It is hoped thus to obtain an available list of eight or ten men, in addition to filling the two vacancies. The examination will be strictly competitive, and is open to any American citizen who fulfills the following requirements:

He must be not less than twenty-one, nor more than twenty-eight, years of age, physically sound and well formed, and not less than 5 ft. 3 in. in height. He must have had not less than eighteen months' experience in a machine shop, or responsible charge of a steam engine for that length of time. In addition, he must also have had not less than six months' sea service on board of a sea-going vessel. If the applicant is a graduate of a technical institution, his four years training in this manner will be accepted in lieu of the shop experience, but the requirement of six months' sea service will be insisted upon.

The examination, which will be written, will include the following subjects: Grammar, spelling, punctuation, composition, elementary mathematics, elementary mechanics and physics, practical problems connected with steam engineering, the chemistry of combustion and corrosion, theory of expansion, the steam engine indicator, the calculation of horse power, strength of materials, and the description of the various types of engines, boilers, condensers, propellers, etc. The standard of proficiency is placed at 75 per cent., and all those obtaining that average will be placed on the eligible list. The examination will be conducted by a board of officers of which Engineer-in-Chief J. W. Collins of the revenue cutter service will be the president and will be held in the city of Washington as soon as a sufficient number of applicants have presented themselves.

The pay of a second assistant engineer on board ship is \$1,308 per annum. Once admitted, the candidate is then in the line of promotion, which is made in strict accordance with seniority. A first assistant engineer receives \$1,608 per annum, and a chief engineer \$1,908. If detailed on shore duty, engineer officers receive \$25, \$30 or \$40 per month in addition to the above rates of pay, as commutation of quarters. Vessels of the revenue cutter service are stationed at the leading ports on the Atlantic, Pacific and Gulf coasts. There are also two vessels stationed on the great lakes, and every summer four or five cutters are detailed to patrol

the waters of Alaska and the Bering sea, cruising from Sitka to Point Barrow at the extreme north. One or two of these vessels make annual cruises to northeastern Siberia. A tour of duty on one station lasts for three years, at the expiration of which the officer is transferred to another vessel.

Appointments in this service are similar in all respects to those in the army and navy, and its officers are liable to dismissal only for gross misconduct. Full particulars of the approaching examination can be learned by addressing a communication, in the applicant's own handwriting, to the secretary of the treasury, Washington, D. C.

**TWO BILLIONS IN COTTON EXPORTS.**

King Cotton made his best record in the fiscal year just closed. The figures of the treasury bureau of statistics show that the value of the raw cotton exported in the fiscal year 1901 was more than in any previous year in the history of the country, and that the total value of cotton and its products exported averaged \$1,000,000 for every day in the year. The total value of raw cotton exported in 1901 was \$313,673,443, against \$290,712,898 in the best year ever before known, 1891; and the total value of cotton, cotton goods, cotton seed oil and meal and other products of that plant exported was \$365,405,707. In quantity the exports of the year were not so great as in 1895, 1898 or 1899, but the price was so much better that the value exceeded by many millions that of the years of the greatest movement as measured in pounds. This brings the export value of cotton and its products above that of all breadstuffs or all classes of provisions, and only about \$100,000,000 less than breadstuffs and provisions combined, the year's exports of breadstuffs being \$275,594,618, and of provisions \$196,958,878. The aggregate value of the cotton exports in the past decade is over \$2,000,000,000.

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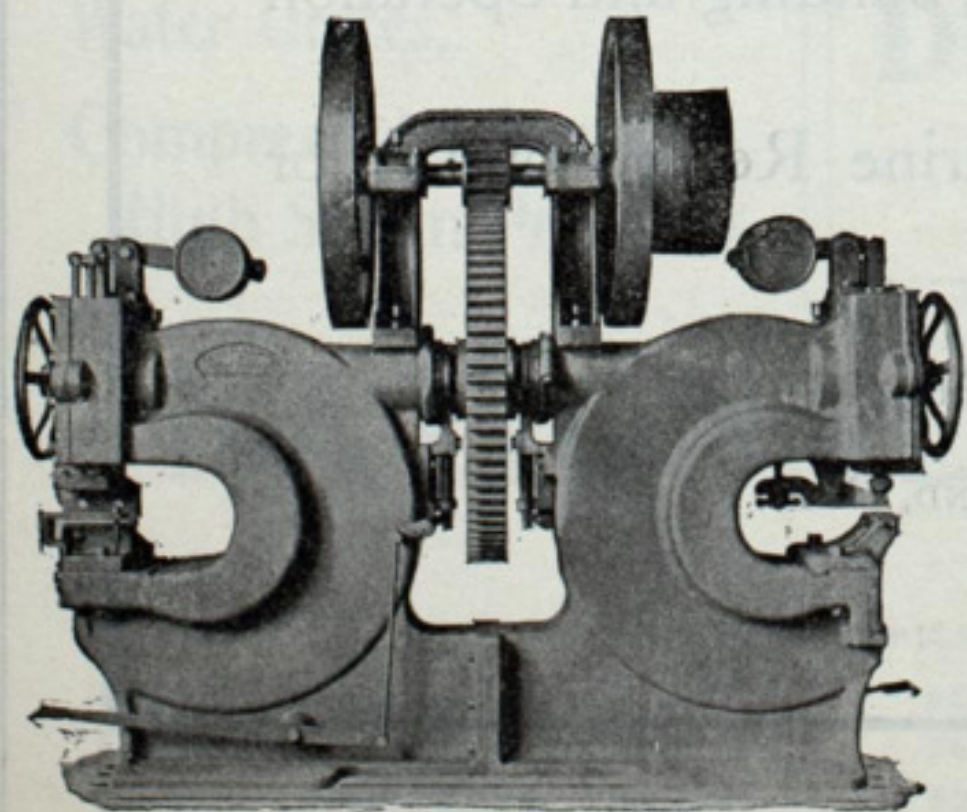
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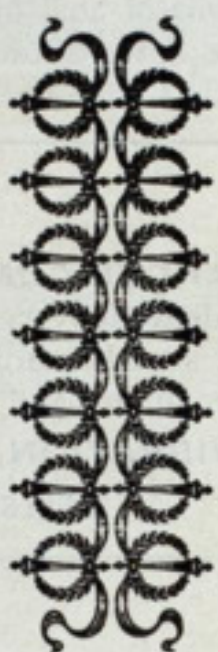
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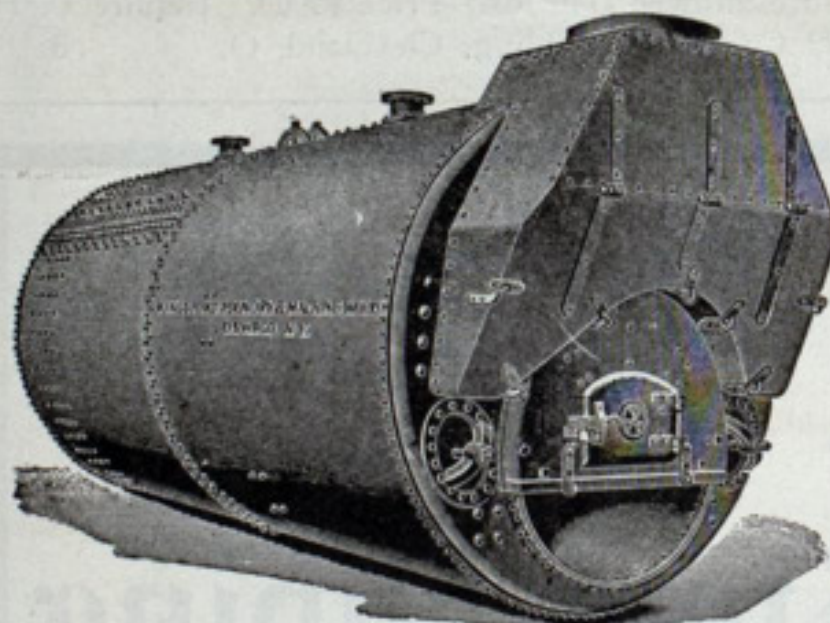
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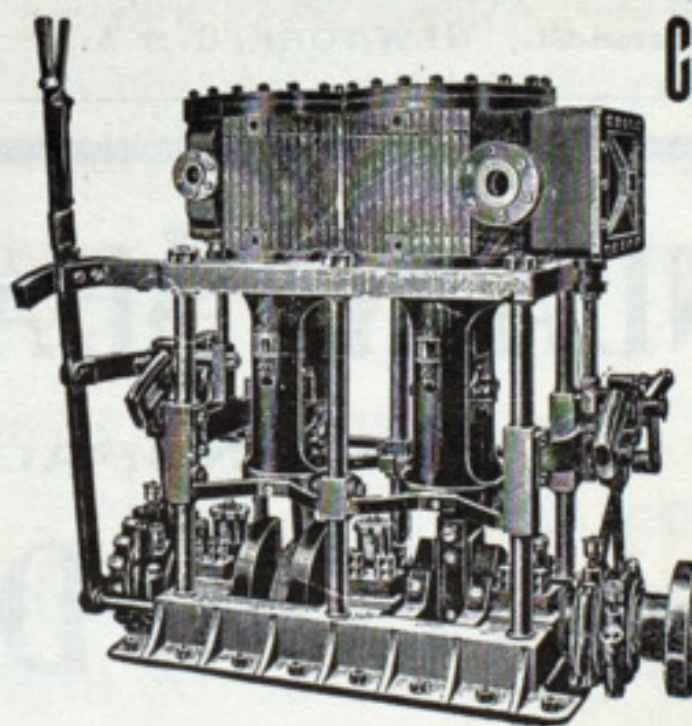
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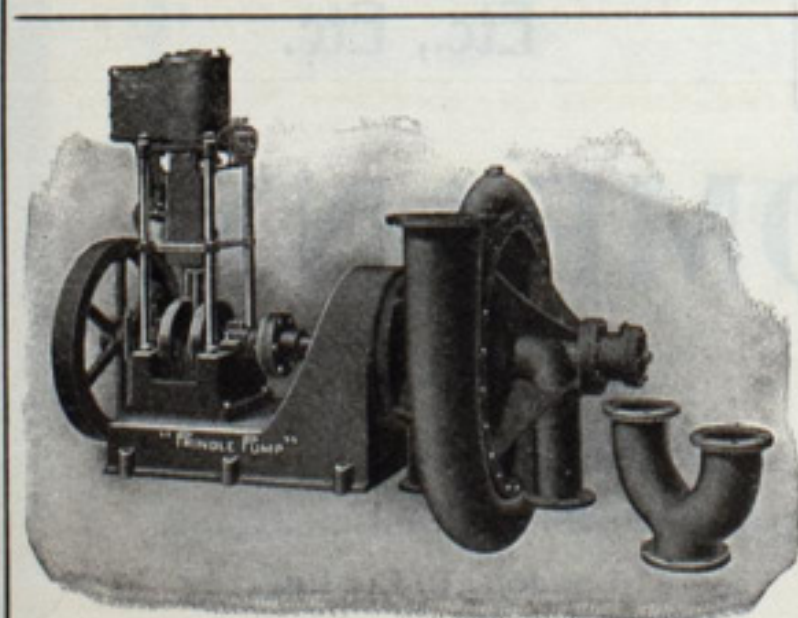
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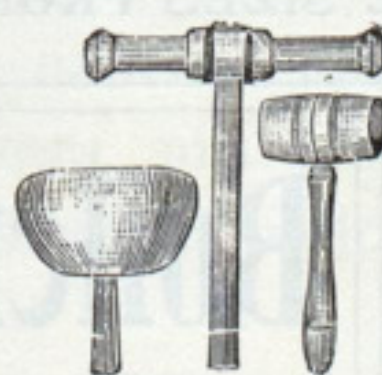


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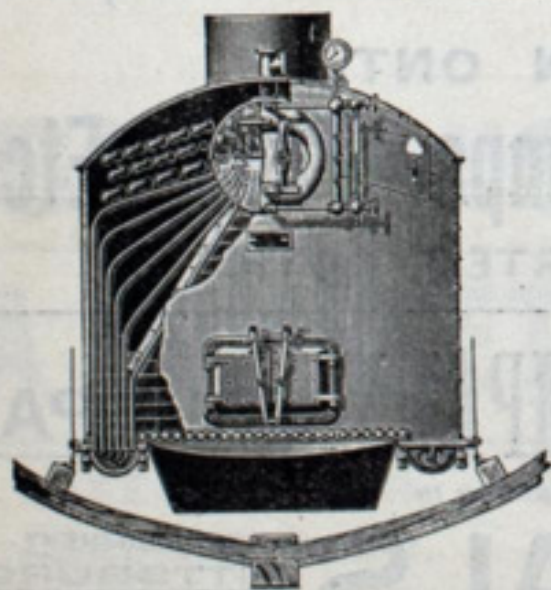
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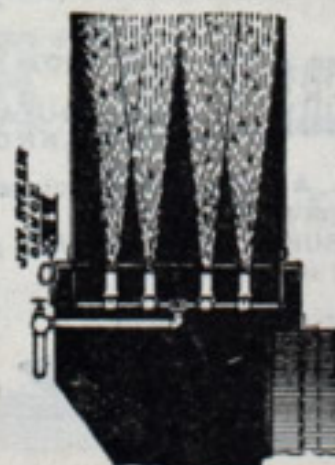
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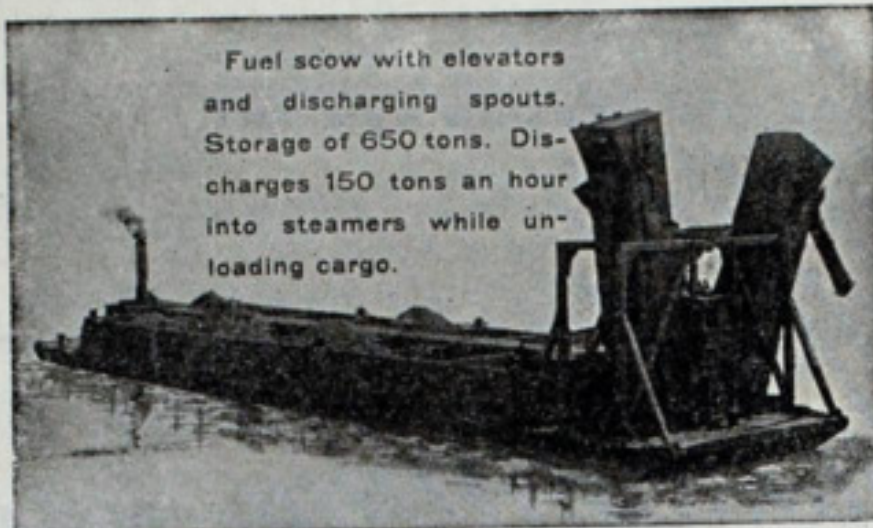
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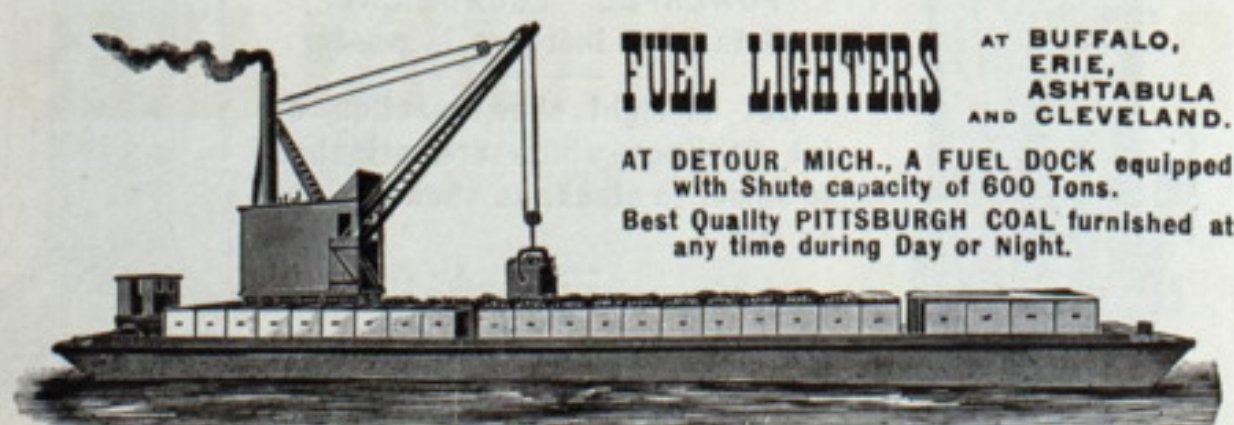
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## PAINTS.

Baker, Howard H. & Co.....Buffalo.  
 Toch Bros.....New York.  
 Upson-Walton Co.....Cleveland.

## PATENT ATTORNEYS.

Thurston &amp; Bates.....Cleveland.

## PATTERN SHOP MACHINERY.

Atlantic Works, Inc.....Philadelphia.

## PIPE THREADING AND CUTTING MACHINES.

Merrell Mfg. Co.....Toledo, O.

## PIPE, WROUGHT IRON.

Bourne-Fuller Co.....Cleveland.  
 Crane Co.....Chicago.

## PLANERS OF ALL KINDS.

Bement, Miles & Co.....Philadelphia.  
 Niles Tool Works Co.....Hamilton, O.

## PLANING MILL MACHINERY.

Atlantic Works, Inc.....Philadelphia.

## PLATE BENDING AND PLANING MACHINES.

Bement, Miles & Co.....Philadelphia.  
 Cleveland Punch & Shear Works Co.....Cleveland.  
 Niles Tool Works Co.....Hamilton, O.  
 Wood & Co., R. D.....Philadelphia.

## PLUMBING, MARINE.

Reilly Repair & Supply Co., James.....New York.  
 Sands, Alfred B. & Son.....New York.

## PNEUMATIC TOOLS.

Standard Pneumatic Tool Co.....Chicago.

## POLISH FOR METALS.

Bertram's Oil Polish Co.....Boston.  
 Paul & Co., J. C.....Chicago.

## PRESSURE REGULATORS.

D'Este Co., Julian.....Boston.

## PROPELLER WHEELS.

American Ship Building Co.....Cleveland.  
 Atlantic Works.....East Boston, Mass.  
 Bath Iron Works, Ltd.....Bath, Me.  
 Cramp, Wm. & Sons.....Philadelphia.  
 Detroit Shipbuilding Co.....Detroit.  
 Farrar & Trefts.....Buffalo.  
 Fore River Ship & Engine Co.....Quincy, Mass.  
 Hardy, John B.....Tacoma, Wash.  
 Hyde Windlass Co.....Bath, Me.

Harlan & Hollingsworth Co.....Wilmington, Del.  
 Hodge, S. F. & Co.....Detroit.  
 Jenks Ship Building Co.....Port Huron, Mich.  
 Lockwood Mfg. Co.....East Boston, Mass.  
 MacKinnon Mfg. Co.....Bay City, Mich.  
 Maryland Steel Co.....Sparrow's Point, Md.  
 Moran Bros. Co.....Seattle, Wash.  
 Neale & Levy Ship & Engine Bldg. Co.....Philadelphia.  
 Newport News Ship Building Co.....Newport News, Va.  
 Nixon, Lewis.....Elizabeth, N. J.  
 Phosphor Bronze Smelting Co., Ltd.....Philadelphia.  
 Pusey & Jones Co.....Wilmington, Del.  
 Risdon Iron Works.....San Francisco.  
 Sheriffs Mfg. Co.....Milwaukee.  
 Trigg, Wm. R. Co.....Richmond, Va.  
 Trout, H. G.....Buffalo.  
 Union Iron Works.....San Francisco.

## PROJECTORS, ELECTRIC.

Badt-Goltz Engineering Co.....Chicago.  
 Elwell-Parker Electric Co.....Cleveland.  
 General Electric Co.....Schenectady, N. Y.  
 Rushmore Dynamo Works.....Jersey City, N. J.  
 Seidler-Miner Electric Co.....Detroit.  
 Westinghouse Electric & Mfg. Co.....Pittsburg.

## PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F. Mfg. Co.....New York.  
 Kingsford Foundry & Machine Works.....Oswego, N. Y.  
 Wood, R. D. & Co.....Philadelphia.  
 Worthington, Henry R.....New York.

## PUNCHES, RIVETERS, SHEARS.

Bement, Miles & Co.....Philadelphia.  
 Cleveland Punch & Shear Works Co.....Cleveland.  
 Niles Tool Works Co.....Hamilton, O.  
 Wood, R. D. & Co.....Philadelphia.

## REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register.....Cleveland.

## RELEASING HOOKS FOR DETACHING BOATS.

Standard Automatic Releasing Hook Co.....New York.

## RIVETS, STEEL, FOR SHIPS AND BOILERS.

Bourne-Fuller Co.....Cleveland.  
 Champion Rivet Co.....Cleveland.

## R. I. W. DAMP RESISTING PAINT.

Toch Bros.....New York.

## RIGGING ROPE (WIRE).

American Steel &amp; Wire Co.....Chicago.

## RUBBER GOODS.

Hale Rubber Co., Alfred.....So. Boston, Mass.

## RUBBER INSULATED WIRES.

Roebling's Sons, John A.....New York and Cleveland.  
 American Steel & Wire Co.....Chicago.

## SAFETY VALVES.

American Steam Gauge Co.....Boston.  
 Ashton Valve Co.....Boston.  
 Crosby Steam Gage & Valve Co.....Boston.

## SAIL MAKERS.

Baker, Howard H. & Co.....Buffalo.  
 Upson-Walton Co.....Cleveland.  
 Wilson & Silsby.....Boston.

## SALVAGE COMPANIES.

See wrecking companies.

## SEAM COMPOSITION AND ELASTIC SEAM PAINT.

Cole &amp; Kuhls.....Brooklyn.

## SEARCH LIGHTS.

Badt-Goltz Engineering Co.....Chicago.  
 Elwell-Parker Electric Co.....Cleveland.  
 General Electric Co.....Schenectady, N. Y.  
 Rushmore Dynamo Works.....Jersey City, N. J.  
 Seidler-Miner Electric Co.....Detroit.  
 Westinghouse Electric & Mfg. Co.....Pittsburg.

## SHAPERS.

Bement, Miles & Co.....Philadelphia.  
 Niles Tool Works Co.....Hamilton, O.  
 Pratt & Whitney Co.....Hartford, Conn.

## SHEARS.

See punches, riveters and shears.

## SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co.....Cleveland.

## SHIP BUILDERS.

American Ship Building Co.....Cleveland.  
 Atlantic Works.....East Boston, Mass.  
 Bath Iron Works, Ltd.....Bath, Me.  
 Buffalo Dry Dock Co.....Buffalo.  
 Cramp, Wm. & Sons.....Philadelphia.  
 Craig Ship Building Co.....Toledo, O.  
 Chicago Ship Building Co.....Chicago.  
 Detroit Shipbuilding Co.....Detroit.  
 Fore River Ship & Engine Co.....Quincy, Mass.  
 Hardy, John B.....Tacoma, Wash.  
 Harlan & Hollingsworth Co.....Wilmington, Del.  
 Jenks Ship Building Co.....Port Huron, Mich.  
 Lockwood Mfg. Co.....East Boston, Mass.  
 Maryland Steel Co.....Sparrow's Point, Md.  
 Moran Bros. Co.....Seattle, Wash.  
 Neale & Levy Ship & Engine Bldg. Co.....Philadelphia.  
 Newport News Ship Building Co.....Newport News, Va.  
 Nixon, Lewis.....Elizabeth, N. J.  
 Pusey & Jones Co.....Wilmington, Del.  
 Risdon Iron Works.....San Francisco.  
 Roach's Ship Yard.....Chester, Pa.  
 Trigg, Wm. R. Co.....Richmond, Va.  
 Union Iron Works.....San Francisco.  
 Willard, Chas. P. & Co.....Chicago.

## SHIP CHANDLERS.

Baker, Howard H. & Co.....Buffalo.  
 Moran Bros. Co.....Seattle, Wash.  
 Reilly Repair & Supply Co., James.....New York.  
 Upson-Walton Co.....Cleveland.



## BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

## SPARS—LARGE SIZES.

Moran Bros. Co.....Seattle, Wash.

## STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

## STEAM VESSEL FOR SALE.

Holmes, Samuel.....New York.

## STEAMSHIP LINES, PASS. AND FREIGHT.

Algoma Central Co.....Sault Ste. Marie, Ont.  
 American Line.....New York.  
 Cleveland & Buffalo Transit Co.....Cleveland.  
 Dominion Line.....Boston.  
 Erie & Western Trans. Co.....Buffalo.  
 International Nav. Co.....Philadelphia.  
 Red Star Line.....New York.

## STEEL CASTINGS.

Seaboard Steel Casting Co.....Chester, Pa.

## STEERING APPARATUS.

American Ship Building Co.....Cleveland.  
 Chase Machine Co.....Cleveland.  
 Detroit Shipbuilding Co.....Detroit.  
 Electro-Dynamic Co.....Philadelphia.  
 Hyde Windlass Co.....Bath, Me.  
 Jenks Ship Building Co.....Port Huron, Mich.  
 Queen City Engineering Co.....Buffalo.  
 Sheriffs Mfg. Co.....Milwaukee.

## STOCKS, BONDS, SECURITIES.

Wright, Herbert &amp; Co.....Cleveland.

## STOCKLESS ANCHORS.

Baldt Anchor Co.....Chester, Pa.  
 International Anchor Co.....Cleveland.

## SUBMARINE DIVING APPARATUS.

Hale Rubber Co., Alfred.....So. Boston, Mass.

## SURVEYORS, MARINE.

Gaskin, Edward.....Buffalo.  
 See, Horace.....New York.  
 Wood, W. J.....Chicago.

## TELEGRAPH—DECK AND ENGINE ROOM.

Cory, Chas. &amp; Son.....New York.

## TESTS OF MATERIAL.

Hunt, Robert W. & Co.....Chicago.  
 Pittsburgh Testing Laboratory, Ltd.....Pittsburg.

## THERMOMETERS FOR MECHANICAL PURPOSES.

Helios-Upton Co.....Peabody, Mass.

## TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Bement, Miles & Co.....Philadelphia.  
 Cleveland Punch & Shear Works Co.....Cleveland.  
 New Doty Mfg. Co.....Janesville, Wis.  
 Niles Tool Works Co.....Hamilton, O.  
 Pond Machine Tool Co.....Plainfield, N. J.  
 Pratt & Whitney Co.....Hartford, Conn.  
 Standard Pneumatic Tool Co.....Chicago.  
 Watson-Stillman Co.....New York.  
 Wood, R. D. & Co.....Philadelphia.

## TOOLS, WOOD WORKING.

Atlantic Works, Inc.....Philadelphia.

## TOPOPHONE—Prevents disasters in fogs.

Colt Co. J. B.....New York.

## TOWING MACHINES.

American Ship Windlass Co.....Providence, R. I.  
 Chase Machine Co.....Cleveland.

## TOWING COMPANIES.

Donnelly Salvage & Wrecking Co.....Kingston, Ont.  
 Midland Towing & Wrecking Co., Ltd.....Midland, Ont.  
 Swain Wrecking Co.....Detroit.

## TRAPS, STEAM.

D'Este Co., Julian.....Boston.  
 Haines Co., Wm. S.....Philadelphia.

## TRUCKS.

Boston &amp; Lockport Block Co.....Boston.

## TUBING, SEAMLESS.

Benedict & Burnham Mfg. Co.....Waterbury, Conn.  
 Standard Seamless Tube Co.....Pittsburg.

## VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co.....Boston.  
 Ashton Valve Co.....Boston.  
 Crane Co.....Chicago.  
 Crosby Steam Gauge & Valve Co.....Boston.  
 D'Este Co., Julian.....Boston.  
 Jenkins Bros.....New York.  
 Wood & Co., R. D.....Philadelphia.

## VARNISH PAINT.

Mair, John &amp; Son.....Philadelphia.

## VESSEL AND FREIGHT AGENTS.

Boland, John J.....Buffalo.  
 Brown & Co.....Buffalo.  
 Chamberlain & Co., S. R.....Chicago.  
 Drake & Maytham.....Buffalo.  
 Elphicke, C. W. & Co.....Chicago.

Hall & Root.....Buffalo.  
 Helm, D. T. & Co.....Duluth, Minn.  
 Holmes, Samuel.....New York.  
 Hutchinson & Co.....Cleveland.  
 Keith, J. G. & Co.....Chicago.  
 Kennedy Hunter & Co.....Antwerp.  
 Mitchell & Co.....Cleveland.  
 Richardson, W. C.....Cleveland.  
 Sullivan, D. & Co.....Chicago.  
 Tandy, Frank N.....Boston.

## VENTILATING APPARATUS FOR SHIPS.

American Blower Co.....Detroit.  
 Boston Blower Co.....Hyde Park, Mass.  
 Buffalo Forge Co.....Buffalo.  
 Sturtevant, B. F. Co.....Boston.

## WIRE ROPE AND WIRE ROPE FITTINGS.

American Steel & Wire Co.....Chicago.  
 Baker, H. H. & Co.....Buffalo.  
 Roebling's Sons, John A.....New York and Cleveland.  
 Upson-Walton Co.....Cleveland.

## WHISTLES, STEAM.

American Steam Gauge Co.....Boston.  
 Ashton Valve Co.....Boston.  
 Crosby Steam Gauge & Valve Co.....Boston.  
 Signal & Control Co.....New York.

## WINDLASSES.

American Ship Windlass Co.....Providence, R. I.  
 American Ship Building Co.....Cleveland.  
 Hyde Windlass Co.....Bath, Me.  
 Jenks Ship Building Co.....Port Huron, Mich.

## WINCHES.

American Ship Windlass Co.....Providence, R. I.  
 Hyde Windlass Co.....Bath, Me.

## WOOD WORKING MACHINERY.

Atlantic Works, Inc.....Philadelphia.

## WRECKING AND SALVAGE COMPANIES.

Donnelly Salvage & Wrecking Co.....Kingston, Ont.  
 Midland Towing & Wrecking Co., Ltd.....Midland, Ont.  
 Swain Wrecking Co.....Detroit.

## YACHT SAILS, FITTINGS, HARDWARE, ETC.

Wilson &amp; Silsby.....Boston.

## YACHT AND BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.  
 Gas Engine & Power Co.....New York.  
 Lane & DeGroot.....Brooklyn.  
 Willard, Chas. P. & Co.....Chicago.

## YAWLS.

Drein, Thos. & Son.....Wilmington, Del.  
 Lane & DeGroot.....Brooklyn.

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# MORAN BROS. COMPANY

SEATTLE, WASHINGTON

**SHIP AND ENGINE BUILDERS**  
STEEL AND WOOD VESSELS, STEAM OR SAIL  
FOR OCEAN, SOUND AND RIVER SERVICE

**FOUNDRY, MACHINE, BOILER AND FORGE SHOPS**  
LARGEST TOOLS AND EQUAL TO ANY REQUIREMENT  
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## DRY DOCK AND MARINE RAILWAY

Two-Section balanced floating dry dock, 400 ft. long, 60 ft. between towers; patent steel wedge keel blocks; 12,000 tons displacement.  
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Including every description of ROUGH, DRESSED or KILN DRIED  
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**SPARS** THE LONGEST, LARGEST, CLEAREST AND BEST IN THE  
**PILES** WORLD; ROUGH OR HEWN.  
OR TIMBER OF ANY DESCRIPTION.

CARS FROM ALL TRANSCONTINENTAL ROADS  
ENTER OUR YARDS AND DOCKS

DOCK SHIPMENTS TO ALL PARTS OF THE WORLD

**ELECTRIC CRANE** Capacity to transfer 75 tons from car to vessel  
WE INVITE CORRESPONDENCE

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TOLEDO to SAULT STE. MARIE

Leaves Toledo every Friday, at 11.00 a. m.  
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Goderich, Kincardine, Southampton, Little  
Current, arrive Sault Ste. Marie Sunday 12.00  
noon (eastern time). Returning leave Sault  
Ste. Marie Tuesday at 8.00 a. m.

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SAULT STE. MARIE to MICHIPICOTEN.

Tri-weekly service, calling at inter-  
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Space under this heading 25 cents a line, each insertion, for three inser-  
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engine and good boiler, the latter allowed 120 lbs. steam pressure. Ad-  
dress or apply to J. E. M., 23 Lodge avenue, Cleveland, O. Aug 8

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the use of modern tools as applied to yachts of 30 to 150 ft. length.  
Racine Boat Mnfg. Co., Racine, Wis. d

—FOR SALE—Second-hand Wells balanced quadruple expansion  
engine. Size 8, 12, 16 and 24 by 18 in. Price, \$1,000. Fore River Ship  
& Engine Co., Quincy, Mass. d

—WANTED—Agents to call on all consumers of polishes, particularly  
yachts, steamers, etc. Bertram's Oil Polish Co., Boston, Mass. tf

—FOR SALE—Scott's Coast Pilot, 1901 edition. Great lakes and con-  
necting waters. Fully revised. Price, \$1.50. The Marine Review Pub.  
Co., Cleveland. tf

—FOR SALE—Charts of all the world. Charts of the great lakes al-  
ways in stock. United States Hydrographic Office charts, Coast Survey  
charts, Army Engineer charts. We bind charts and back them with tape,  
so that they will last for years. The Marine Review Pub. Co., Cleveland.  
tf

## LAKE SHORE & MICHIGAN SOUTHERN RAILWAY.

CLEVELAND CITY TICKET OFFICE 237 SUPERIOR ST

| Eastward:—                                   |       | Ar. fr. West. | Dep. East. |
|----------------------------------------------|-------|---------------|------------|
| No. 18, Southwestern Limited                 | ..... | .....         | *1 55 am   |
| No. 22, Lake Shore Limited                   | ..... | *2 15 am      | *2 20 am   |
| No. 26, Pan-American Express                 | ..... | *5 50 am      | *6 00 am   |
| No. 28, New York & Boston Express            | ..... | *7 40 am      | *8 00 am   |
| No. 32, Fast Mail                            | ..... | *11 25 am     | *11 30 am  |
| No. 44, Accommodation, via Sandusky          | ..... | †1 35 pm      | .....      |
| No. 46, Southwestern Express                 | ..... | .....         | *3 00 pm   |
| No. 6, Limited Fast Mail                     | ..... | *5 40 pm      | *5 45 pm   |
| No. 10, Chicago, New York & Boston Special   | ..... | *7 35 pm      | *7 40 pm   |
| No. 16, New England Express                  | ..... | *10 30 pm     | *10 35 pm  |
| No. 2, Day Express                           | ..... | †9 05 pm      | †11 30 pm  |
| No. 126, Norwalk Accommodation               | ..... | †7 55 am      | .....      |
| No. 40, Toledo & Buffalo Accom., via Norwalk | ..... | †10 00 am     | †11 40 am  |
| No. 106, Conneaut Accommodation              | ..... | .....         | †4 30 pm   |
| Westward:—                                   |       | Ar. fr. East. | Dep. West. |
| No. 11, Southwestern Limited                 | ..... | *3 25 am      | .....      |
| No. 15, New York, Boston & Chicago Special   | ..... | *3 05 am      | *3 10 am   |
| No. 21, New York & Chicago Express           | ..... | *5 10 am      | *5 20 am   |
| No. 7, Day Express                           | ..... | .....         | †6 30 am   |
| No. 19, The Lake Shore Limited               | ..... | *7 35 am      | *7 40 pm   |
| No. 23, Western Express                      | ..... | *11 10 am     | *11 15 am  |
| No. 33, Southwestern Express                 | ..... | *12 25 pm     | .....      |
| No. 133, Cleveland & Detroit Express         | ..... | .....         | *12 30 pm  |
| No. 47, Accommodation                        | ..... | .....         | †3 00 pm   |
| No. 141, Sandusky Accommodation              | ..... | .....         | †3 10 pm   |
| No. 127, Norwalk Accommodation               | ..... | .....         | †5 10 pm   |
| No. 37, Pacific Express                      | ..... | *7 00 pm      | *7 20 pm   |
| No. 25, Southern Express                     | ..... | *9 30 pm      | .....      |
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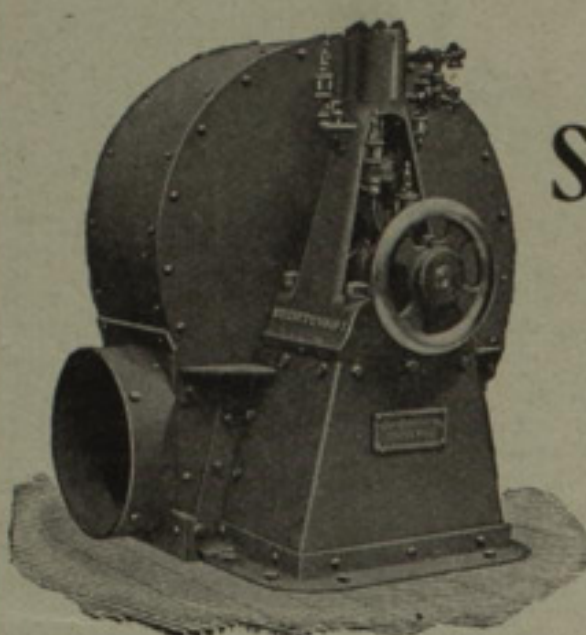
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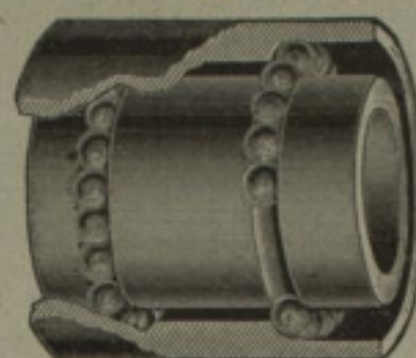
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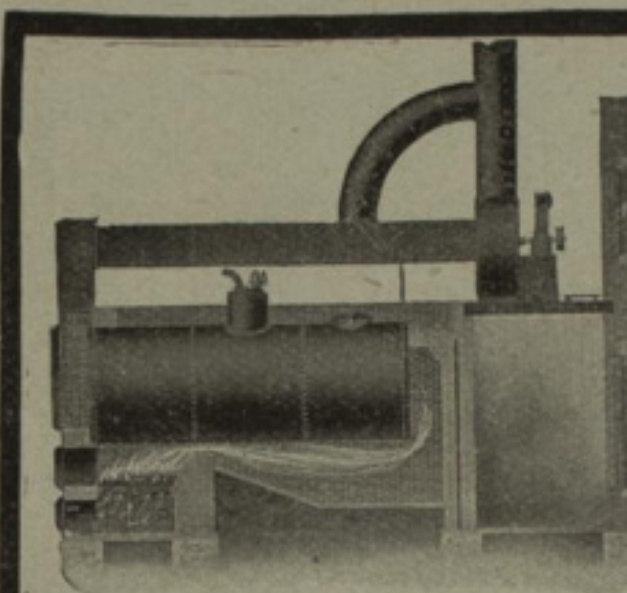


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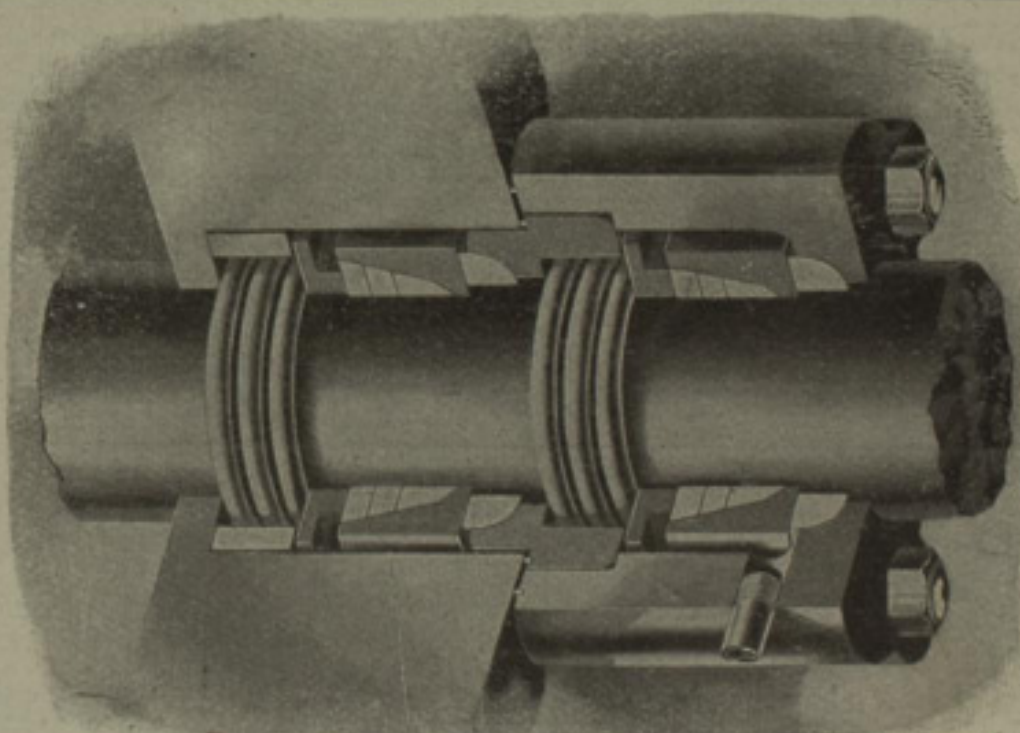
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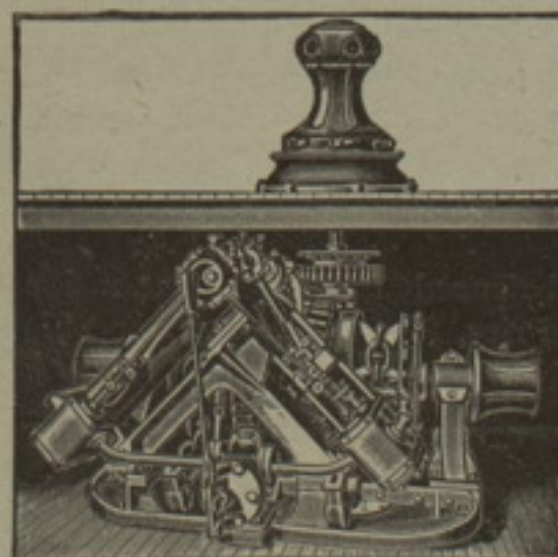
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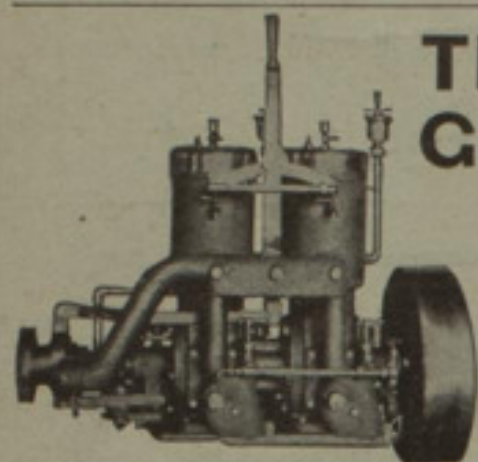
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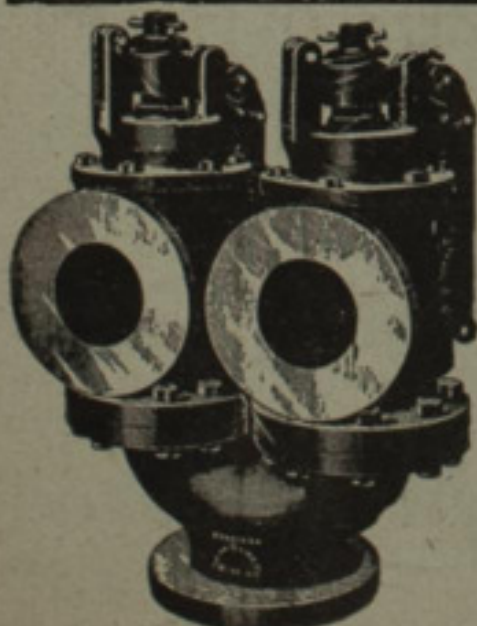
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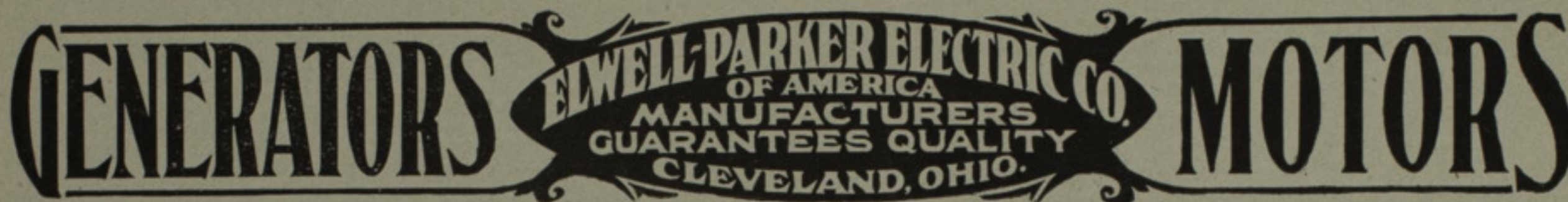
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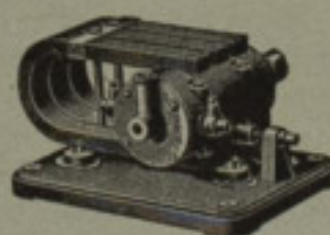
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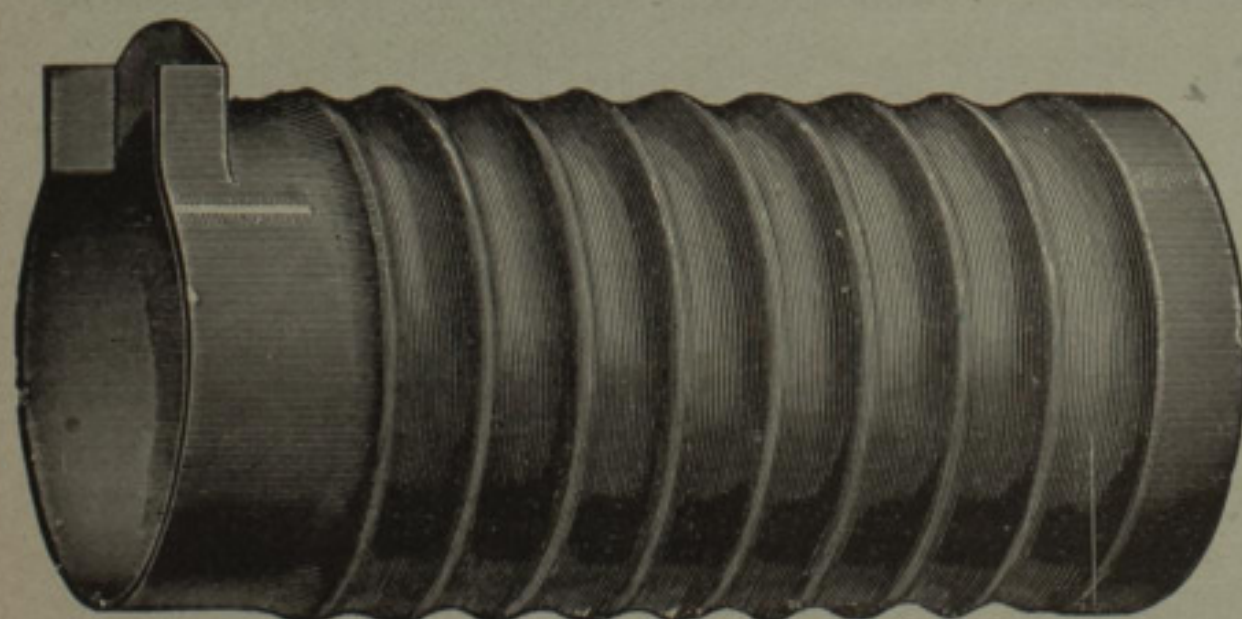
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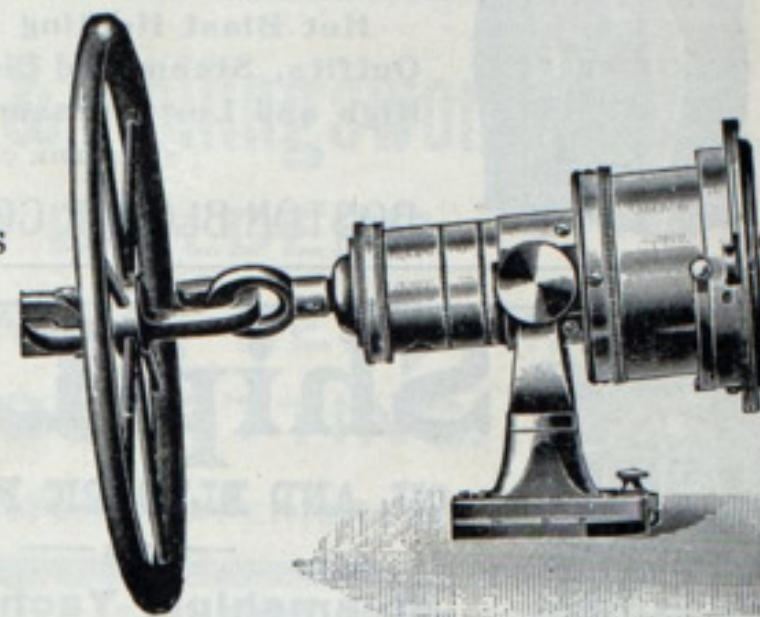
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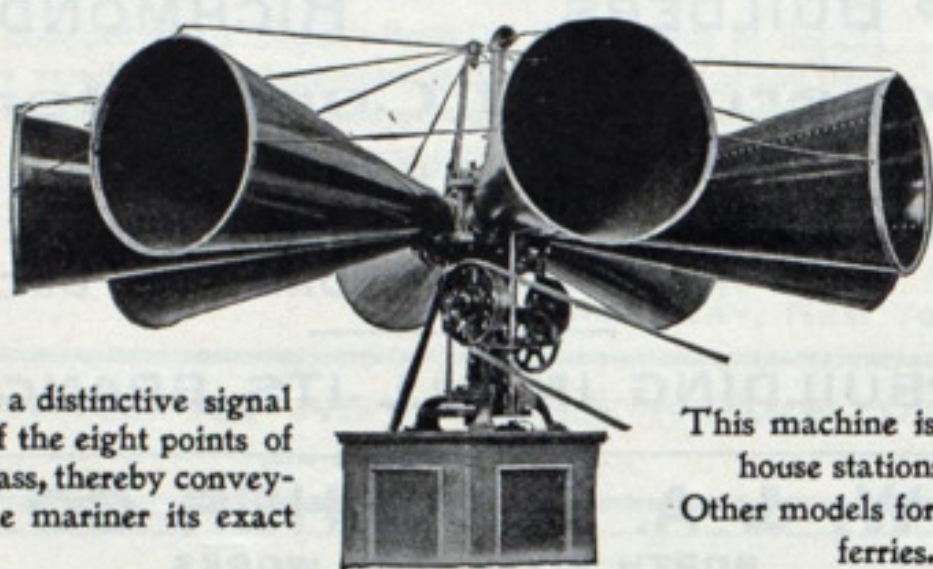
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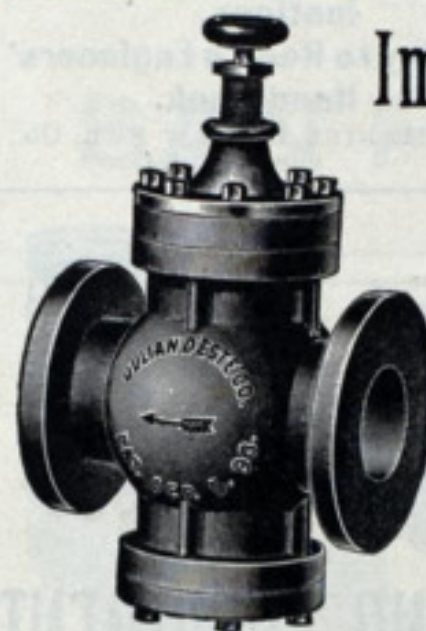
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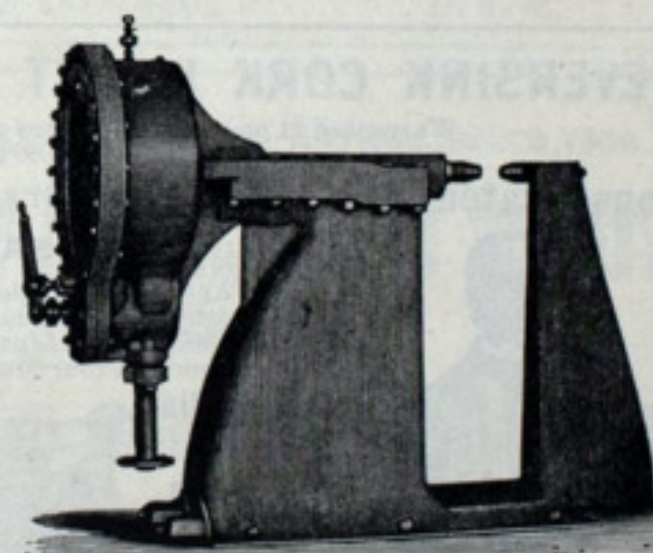
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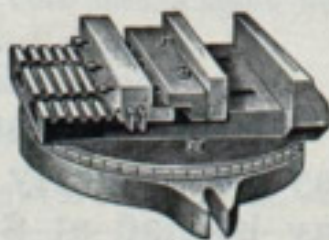
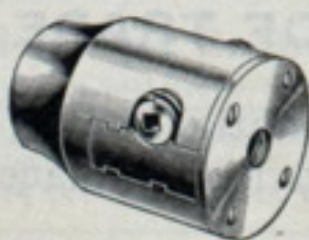
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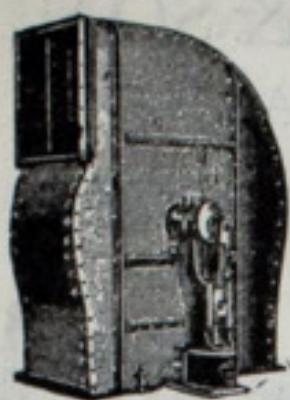
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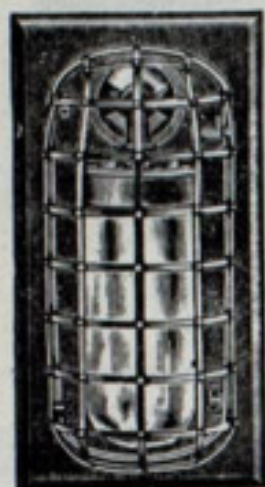
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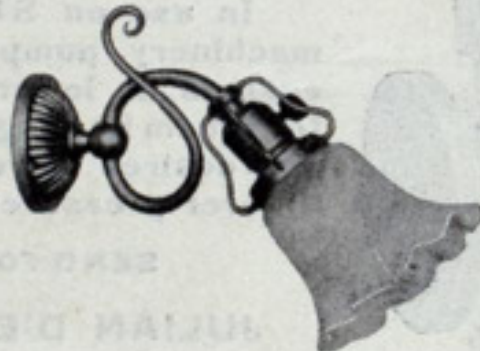
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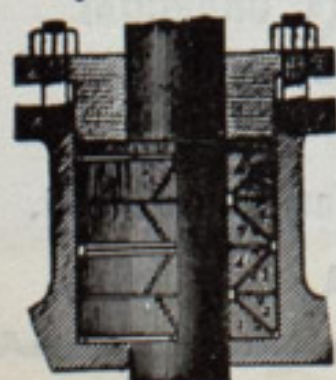
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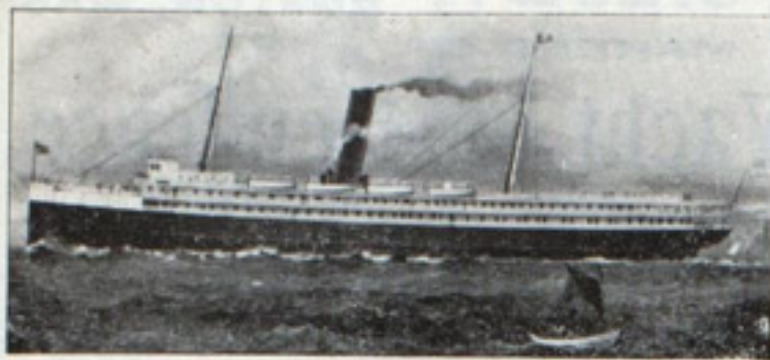
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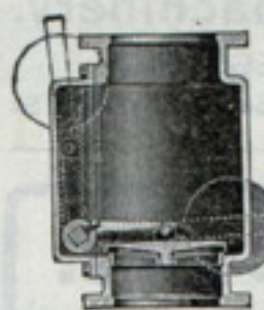
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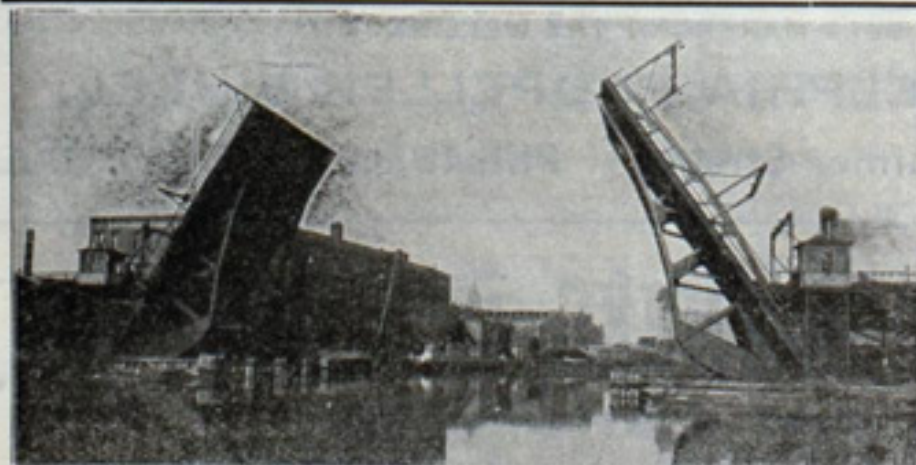
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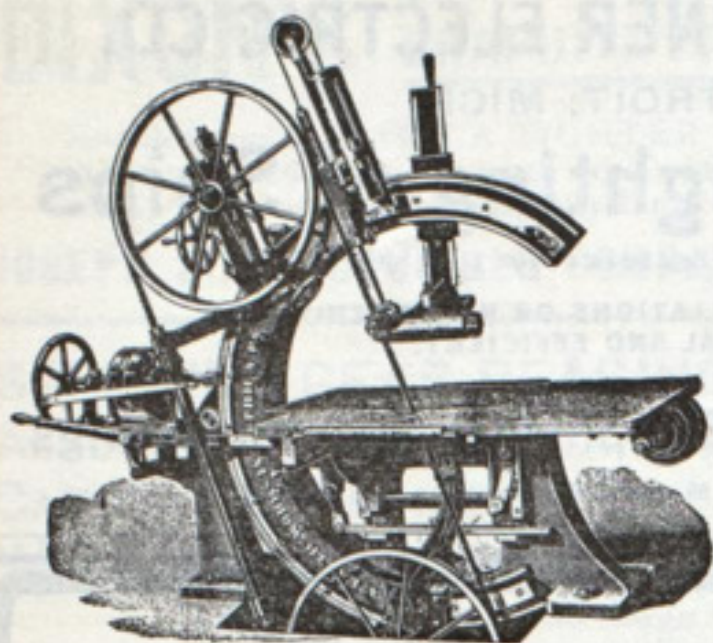
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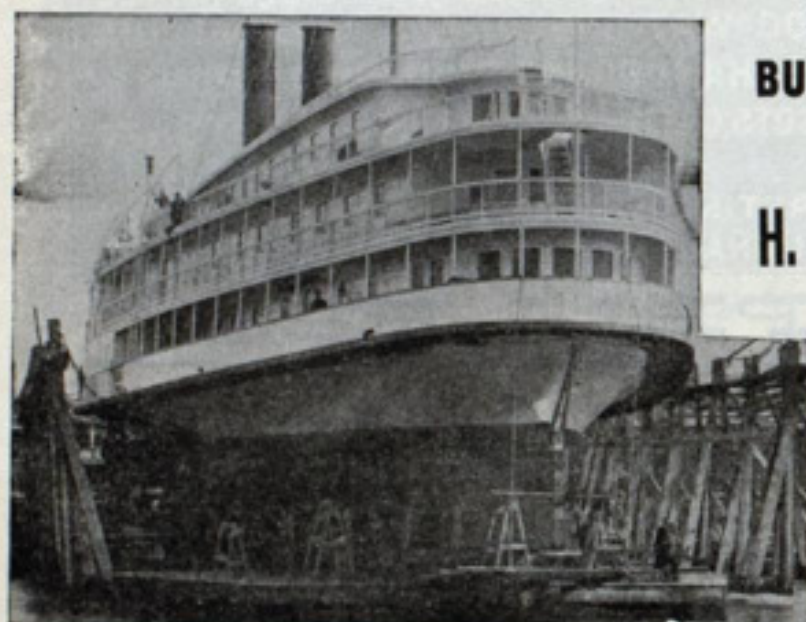
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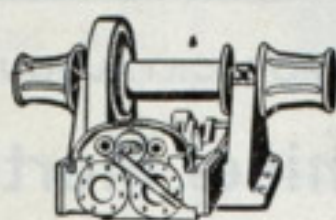
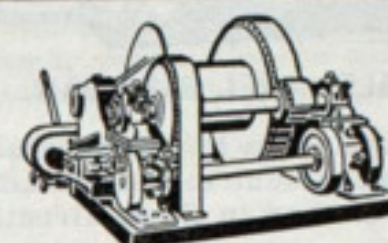
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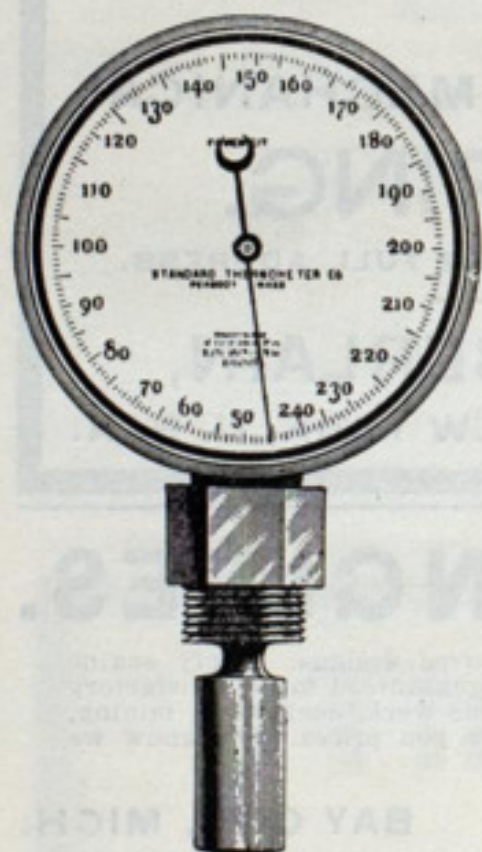
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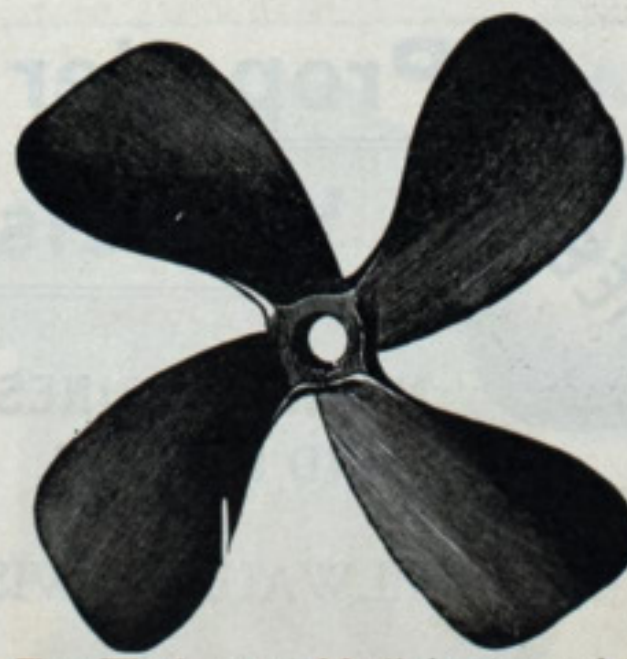
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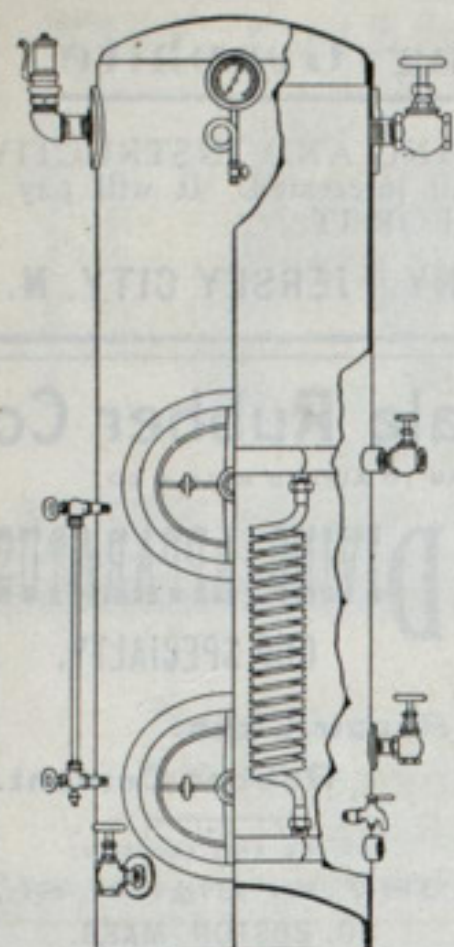
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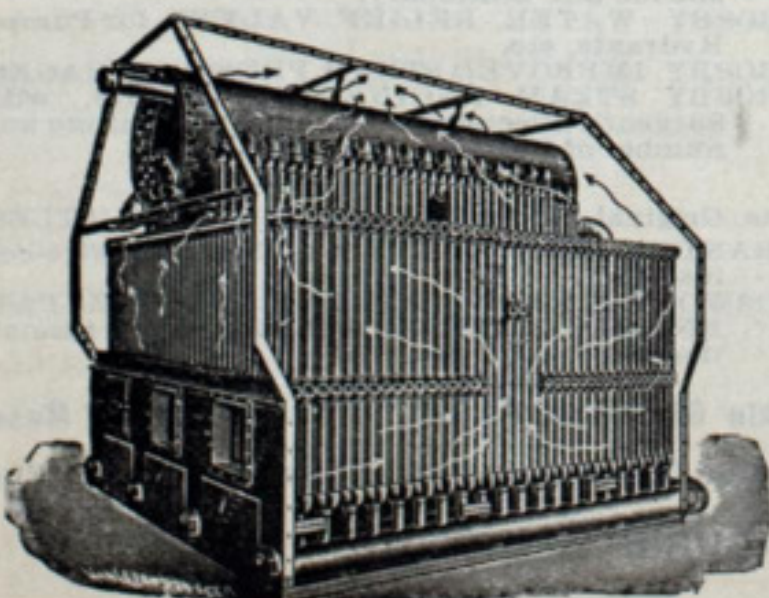
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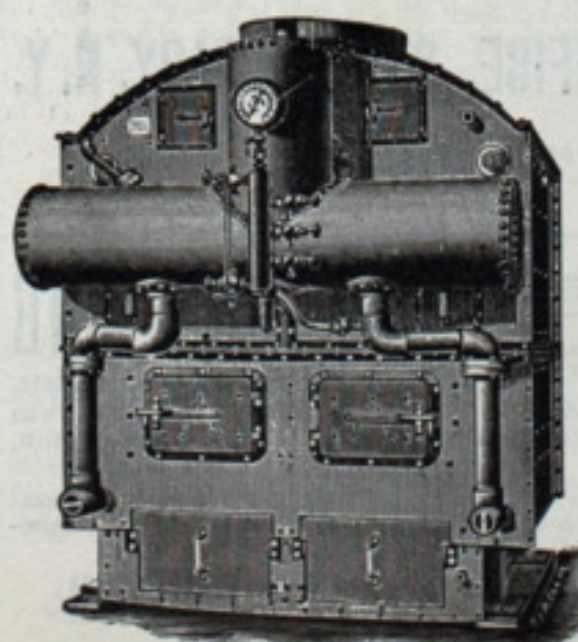
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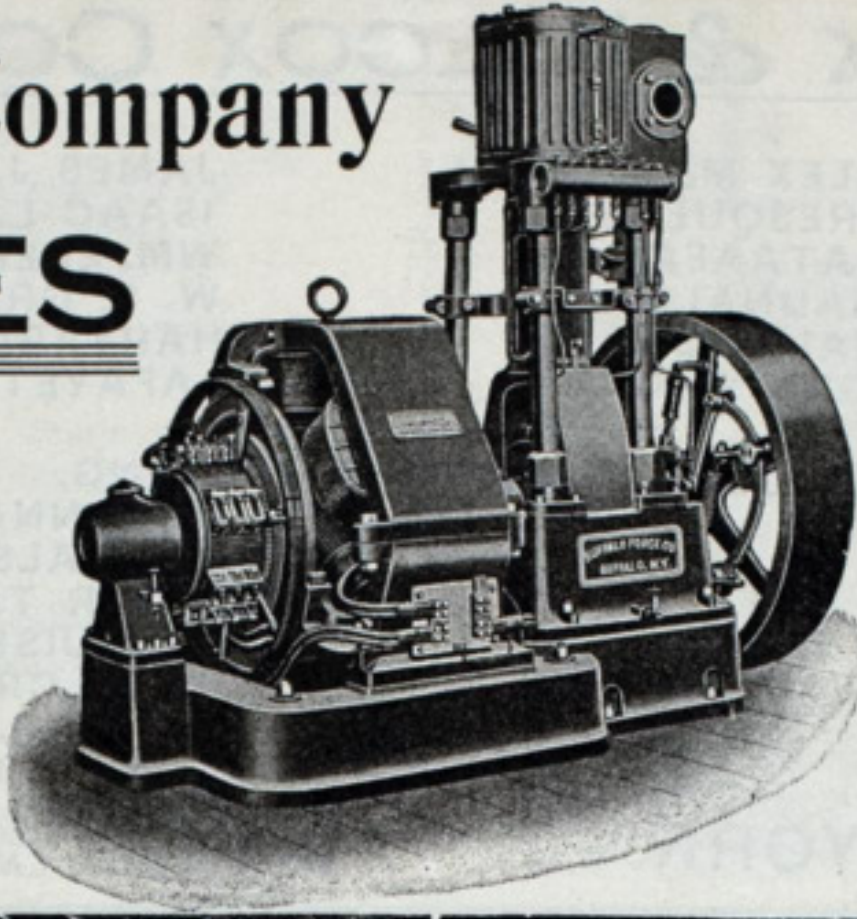




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